

Railway Maintenance Engineer

Volume 13

CHICAGO: Transportation Building
NEW YORK: Woolworth Building

APRIL, 1917

CLEVELAND: Citizens' Building
WASHINGTON: Home Life Building

Number 4

THE
KNOWLEDGED
LEADER OF ALL
RAIL JOINTS



BONZANO-THOMSON RAIL JOINT

THE JOINT AS STRONG AS THE RAIL
IN USE WITHOUT A SINGLE FAILURE

The Q AND C Co.



**Smooth
Riding
Trains
&
Long
Life of
Rolling
Stock**

SMOOTH riding trains, life of rolling stock depend largely on you as a progressive Maintenance of Way Engineer. Yet you know that it is largely through the right selection of switches, frogs, crossings, switch stands, rail braces, etc., such results are secured.

Perhaps our 127 page treatise on all that time and service have proved most efficient in such devices will prove of aid to you as it has to many other Maintenance officials. Better send for the book and see.

THE CINCINNATI FROG & SWITCH CO.

**Manufacturers of Track Equipment of Merit
For Steam and Electric Railway Mines and Mills**

CINCINNATI

OHIO



FROGS = SWITCHES = STANDS

Manganese and Built-Up Construction

IN STOCK for IMMEDIATE SHIPMENT

THE INDIANAPOLIS SWITCH & FROG COMPANY

NEW YORK

SPRINGFIELD, OHIO

CHICAGO

ESTABLISHED 1882

THE WEIR FROG CO.

*Track Work of Rail and
Manganese Steel Construction*

CINCINNATI --- --- --- --- OHIO

THE P. & M. - RAIL ANTI-CREEPERS - VAUGHAN THE

FOR HEAVY SERVICE DOUBLE TRACK.

**THE GREATER THE CREEPING TENDENCY,
THE GREATER IT GRIPS THE RAIL AND
HOLDS.**

FOR SINGLE TRACK.

**THE ACTION OF A POWERFUL TORSION
SPRING KEEPS IT EFFECTIVE UNDER ALL
CONDITIONS OF CREEPING.**

SOLD BY

THE P. & M. CO.

**SAN FRANCISCO
ST. PAUL**

**RAILWAY EXCHANGE
CHICAGO**

**NEW YORK
DENVER**

A POSITIVE WATER SUPPLY

ABSOLUTELY ASSURED BY
G.-A. Pat. Cushioned Controlling Altitude Valves



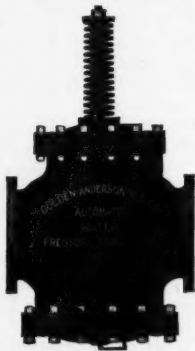
Golden-Anderson Automatic Cushioned Float Valves.

(Angle or Straight Way), up to 24 in.

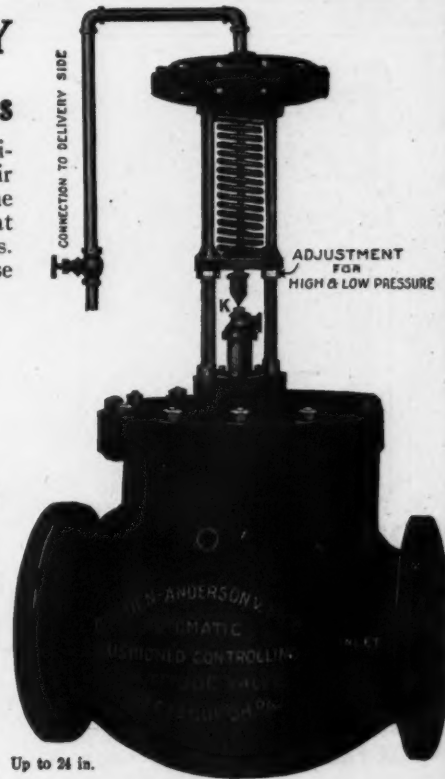
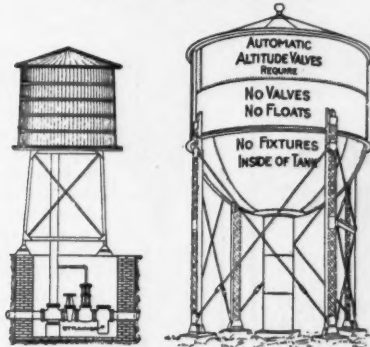
For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks. "Three Ways of Closing These Valves."

- 1st—Automatically by water.
- 2nd—By Electricity, if desired.
- 3rd—By Hand.

"No Metal-to-Metal Seats"
"Hosts of References"



Golden-Anderson Patent Automatic Cushioned Water-Regulating Valves up to 24 in.



Up to 24 in.

Golden-Anderson Valve Specialty Co.
1200 Fulton Bldg. Water and Steam Specialties. PITTSBURGH, PENNA.

Pumps for Railway Water Service

Goulds Fig. 1531 "Pyramid" Pump is a popular pump for tank service, water supply systems for stations, and for fire protection in isolated railroad buildings. It is of very simple design, but is strong and compact. It is built for capacities of 6 to 114 gallons per minute and is good for pumping to total elevations up to 175 feet.

Furnished with pulleys for belt drive or for direct connection to electric motors or gasoline engines.

Bulletin 100 gives complete data. Copy sent on request.



Goulds Fig. 1531 Pyramid Pump, direct connected to motor and mounted on common bed plate.

There is a Goulds Pump for Every Service

Deep Well Heads
Diaphragm Pumps
Centrifugal Pumps
Triplex Pumps
Rotary Pumps
Vacuum Pumps



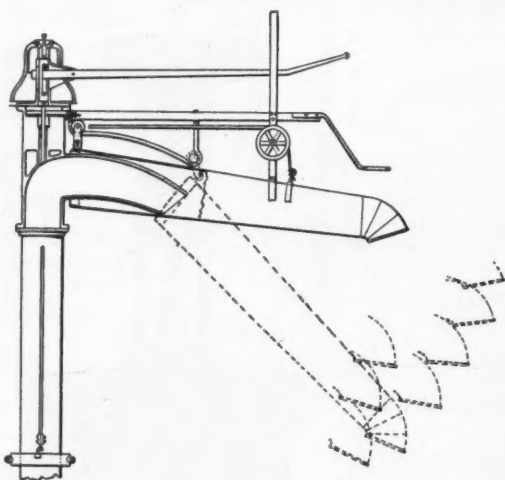
Gould's Fig. 1531 Pyramid Pump with motor mounted on brackets (Form Q drive).

THE GOULDS MANUFACTURING COMPANY

Branch Houses:
BOSTON PHILADELPHIA NEW YORK CHICAGO

Main Office and Works:
SENECA FALLS, N. Y.

District Offices:
PITTSBURGH BALTIMORE ATLANTA HOUSTON



DO YOU LOOK FOR THESE FEATURES IN A WATER COLUMN?

DROP SPOUT POSITIVELY NON-FREEZABLE

Non-freezable telescopic joint over the discharge nozzle of the tee—a joint that is entirely open, without packing or working apart, yet does not waste a bit of water.

WITH ABSOLUTE FLEXIBILITY

The greatest possible flexibility—a vertical adjustment range of five feet and a lateral adjustment range of three feet.

QUICK CLOSURE WITHOUT WATER HAMMER

A valve mechanism so constructed as to positively eliminate water hammer even when the column is connected to a high-pressure main. The University of Illinois comparative tests showed that the Poage Style H Valve offered the least frictional resistance to flow and that the valve closure is correct (University of Illinois Bulletin No. 48).

These features are found only in the

POAGE STYLE H WATER COLUMN EQUIPPED WITH THE FENNER DROP SPOUT

Actual everyday usage has proven that the Poage construction principles are correct. Give the Poage Style H Water Column a rigid tryout—see for yourself how maintenance costs are cut and time is saved. Write for illustrated booklet *now*.

The Poage Water Column and The Fenner Drop Spout are manufactured exclusively by

THE AMERICAN VALVE & METER CO.
CINCINNATI, U.S.A.

EMERSON Steam Pumps

For Railway Construction Work



Front View



Side View

In your next big engineering proposition, consider the importance of positive service in your steam pumps. Consider the Emerson Steam Pump, the strength of its construction features, and what it will do for you in cofferdams, for bridge building, for washeries, and for railway tanks and roundhouses.

Here are some of the facts: Emerson Standard Pumps have the Emerson Patented Engine and Valve with its positive mechanical motion—steam is admitted into the barrels of the pump at positively timed intervals. Engine, valve and gear are hermetically sealed, hence, cannot be injured or clogged.

IMMEDIATE SHIPMENTS FROM STOCK.
1917 Catalogue—No. 12—tells an interesting story.

THE EMERSON PUMP & VALVE COMPANY
Alexandria, Va.

SHERWIN-WILLIAMS

TARGET AND SEMAPHORE COLORS

S-W VISUAL RED, GREEN,
YELLOW, BLACK, BLUE
AND WHITE

High-grade permanent colors
furnished in varnish, in
japan and in oil

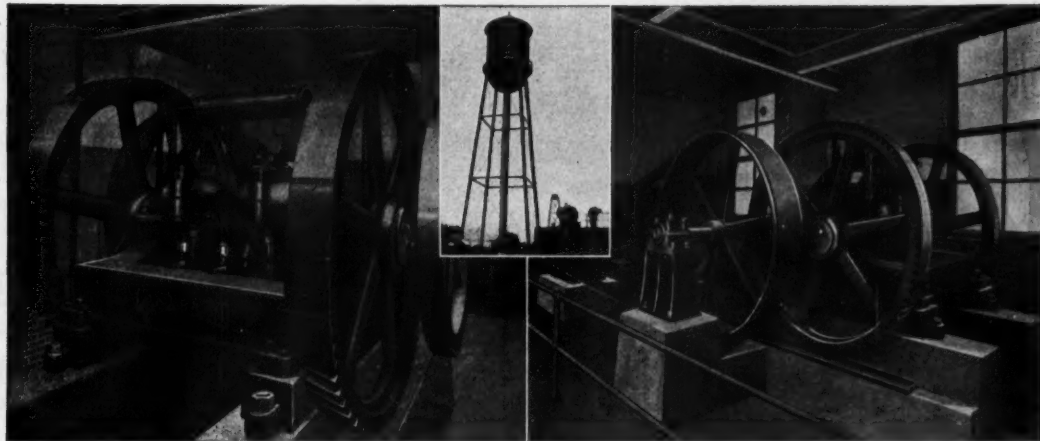


THE SHERWIN-WILLIAMS CO.

Railway Paint and Varnish Makers

Address inquiries to

798 Canal Road, N. W. CLEVELAND, OHIO



An Efficient Deep Well Pumping Unit

The Town of Oglesby, Illinois, recently installed a municipal pumping plant which in many respects is a model installation for conditions where water must be obtained from a deep drilled well and delivered against a high head.

The town uses about 65,000 gallons of water a day, the water being pumped into an elevated tank from which it flows directly into the mains.

During the time the well was being drilled an order was given for an "American" deep well plunger pump, consisting of a Figure 721 working head and an all bronze two stroke water cylinder. This pump has an 18-in. stroke and the cylinders are respectively $9\frac{1}{2}$ and $8\frac{1}{2}$ inches in diameter. The pump was designed to deliver 375 gallons a minute, taking water from 200 feet below the surface and delivering it to elevated tank 125 feet above ground.

When tested the well did not maintain the required delivery at 200 feet depth and the pump was installed to take water from 280 feet below and deliver it 125 feet above the surface. This pump is belt driven by a Westinghouse 50 hp., 3-phase, 60-cycle, 220-volt, slip-ring motor operating at 860 r.p.m.

The accompanying illustrations show exterior and interior views of this installation.

Features of this pump which appeal to discriminating buyers are the low massive working head which operates with little vibration and is very accessible and the plungers being so designed that they may be drawn from the well with the plunger rods without disturbing the casing.

This is one of the latest developments in deep well plunger pumps adapted to the highest pumping duty.

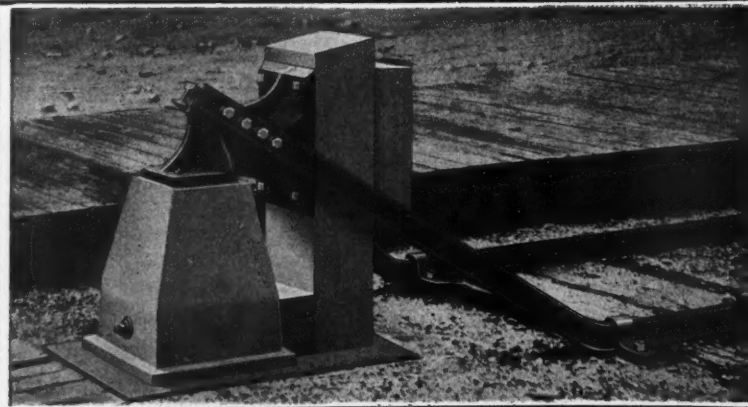
**Write for full information in
reference to these pumps.**

The American Well Works

General Office and Works: Aurora, Ill.
Chicago Office: First National Bank Bldg.

Sales Agencies

New York City	Birmingham, Ala.	San Francisco	Edmonton, Alta.
Philadelphia, Pa.	Kansas City, Mo.	Salt Lake City	Calgary, Alta.
Pittsburgh, Pa.	Joplin, Mo.	Los Angeles	Chatham, Ont.
St. Paul, Minn.	Lincoln, Neb.	Dallas, Texas	Montreal, Que.
St. Louis, Mo.	Denver, Colo.	Artesia, N. M.	



ELLIS PATENT Bumping Post

Simple, Strong and Lasting
Adapted to All Positions

Mechanical Manufacturing Co.
Chicago, Ill.



RAMAPO

Automatic Safety Switch
Stands are Manufactured only by the

Ramapo Iron Works

Write for Descriptive Catalogues on
Switch Stands, Switches, Frogs, Guard
Rail Clamps, Etc.

Manganese Track Work a Specialty.

Ramapo Iron Works Main Office: **HILLBURN, N. Y.**
WORKS: Hillburn, N. Y., and Niagara Falls, N. Y.

KILBY FROG & SWITCH COMPANY

Birmingham, Alabama

Manufacturers of

Frogs, Switches,
Crossings, Etc.

Manganese Track Work
a Specialty

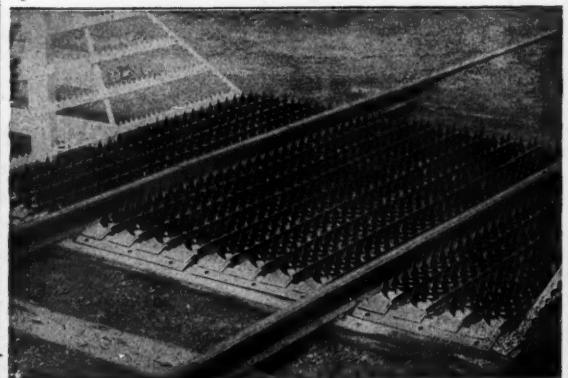
Less Stock Claims

Use the 1917 National Steel Cattle Guard

The new National Steel Cattle Guard is vastly superior to any cattle guard on the market today. It is made of the best grade of *Open Hearth* Steel No. 9 or No. 11 gauge. The "NATIONAL" Cattle Guard is a Mechanical Device, Specially Constructed to turn the most unruly stock. Cannot rattle loose or spread.

Write for new illustrated circular and blue prints describing the 1917 "NATIONAL"—its construction, durability and superiority over other guards.

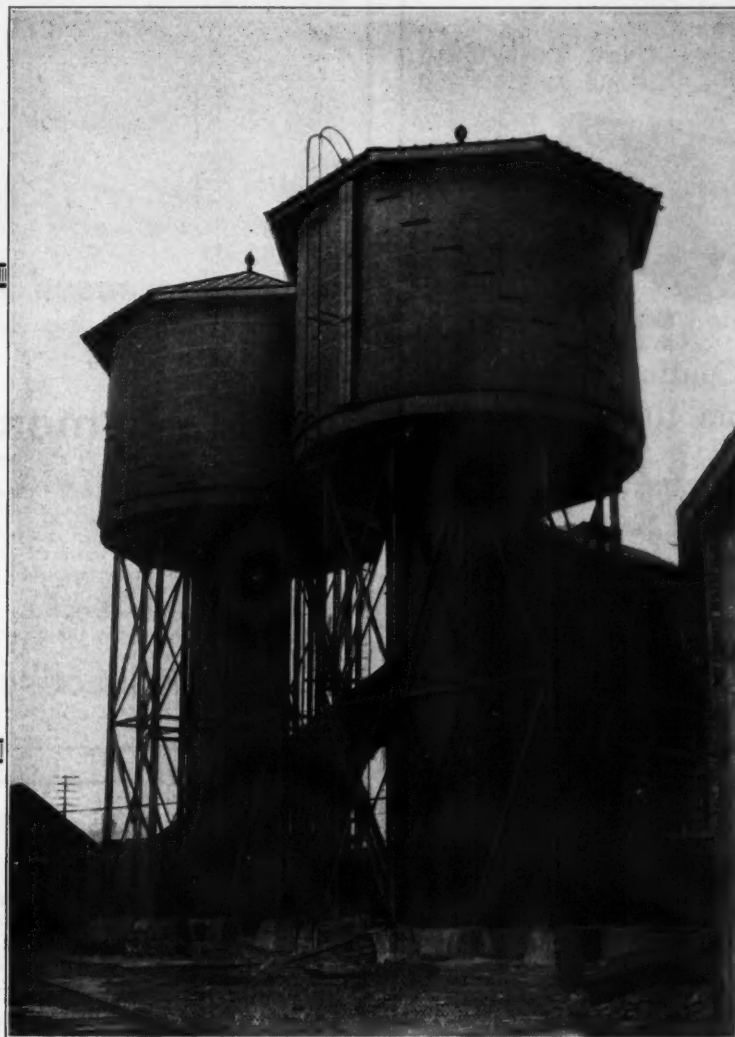
NATIONAL SURFACE GUARD CO.
209 So. La Salle Street, Chicago, Ill.



CHALLENGE TANKS

**FIR
OR
CYPRESS
FOR
DURABILITY**

**FLAT
ROUND
HALF OVAL
OR
HALF ROUND
HOOPS**



**BUILT
TO
YOUR
ORDER**

**HOOPS FOR
REPAIRING
TANKS
A SPECIALTY**

Two 50,000-gallon tanks erected on 30-foot 12-post steel substructures

FOR RAILROAD WORK

This is the Challenge way of making tanks—

Thoroughly seasoned, clear Oregon fir or Louisiana Red Gulf cypress—men specially trained in tank building—modern tank-making machinery. We build tanks large or small, standard or special.

Challenge tanks have proved to give the lowest final cost per thousand gallons because they require the least attention.

Substructures can be furnished in any height required, designed with four or twelve posts to meet the approval of the most exacting engineers. They are easily erected under your own supervision.

CHALLENGE COMPANY

Address Railroad Department

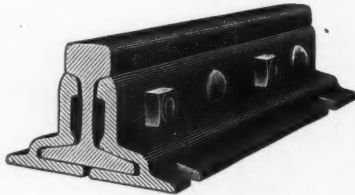
BATAVIA, ILL.

The Rail Joint Co.

GENERAL OFFICES:

61 Broadway

New York City



Continuous Rail Joint

Makers of Continuous, Weber, Wolhaupter and 100% rail joints.

Standard—Insulated—Step—Frog and Switch Types.

**Grand Prize San Francisco
1915**

Protected by Patents



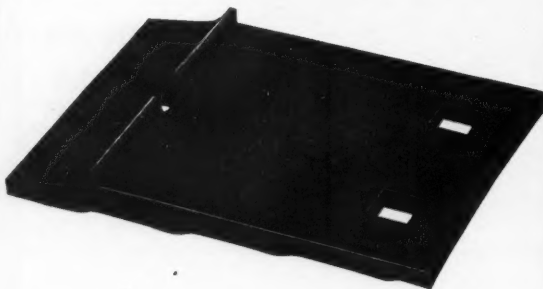
Increased Life

in a crossing is the result of better design, better material and better construction. All three of these are combined in the

Eymon Continuous Crossing

The design eliminates the gaps which cause the destructive pound. The material is manganese steel, which reduces the wear, and the construction is such that maintenance is reduced to a minimum. Service records show that it will *save its first cost every year* it is in operation. Write for the facts.

EYMON CONTINUOUS CROSSING CO.
MARION OHIO



One of the most distinguished, successful and honored Engineers of the United States, while not wishing his name to appear in an advertisement, writes as follows of The

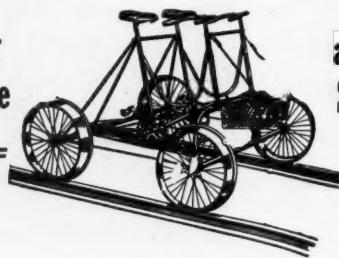
LUNDIE TIE PLATE

"It is by far the most scientifically designed and practically efficient tie plate ever evolved."

JOHN LUNDIE, 52 Broadway, NEW YORK

The Car
of Service

and
Saving



The Car of Service and Saving because it is known to be the strongest and lightest running. The car which delivers results for slight exertion, with the result that repeat orders are constantly received for

HARTLY & TEETER Light Inspection Cars

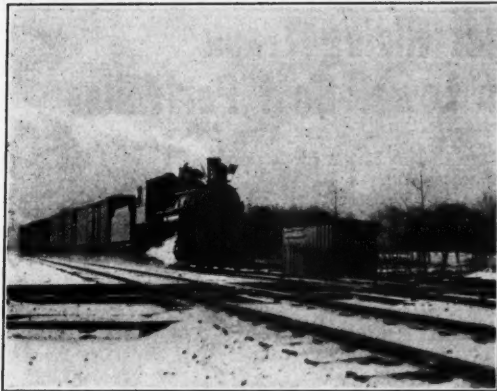
Get the Facts

Send for Booklet

**Teeter-Hartly
Motor Co.**

Hagerstown
Indiana





Balanced Riding Qualities of

INTERNATIONAL STEEL CROSSING FOUNDATIONS

An important factor in maintaining railroad crossings and the track each side is the elimination of the pitching and nosing of heavy engines and cars moving at high speeds.

Perfectly balanced riding qualities are produced by International Steel Crossing Foundations. When this is considered with a 75% reduction in crossing maintenance, the prolonged life of crossing frogs and the practical elimination of bolt breakages, it is easy to see the reason for the constant demand for our

crossing foundations and the large number of repeat orders.

These foundations also prevent rail creepage at railroad crossings, furnish a larger effective tamping area than it is possible to obtain with wooden ties and simplify crossing maintenance.

Let us reduce your railroad crossing maintenance and prolong the life of your crossing frogs. Give us your crossing frog angle, the length of the arms and the number of compromise joints, and we will give you a prompt quotation.

Our new catalog will be of interest and value to you. We will send a copy on request.

The International Steel Tie Company
Manufacturers of Steel Twin Ties and Crossing Foundations
General Sales Office and Works: Cleveland, Ohio

REPRESENTATIVES

Western Eng'g Sales Co.,
Los Angeles, Cal.

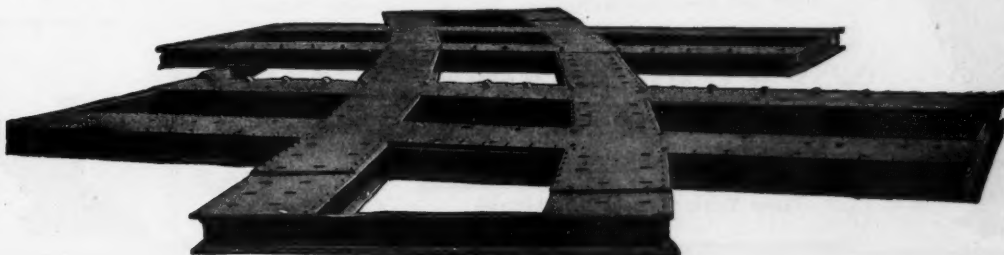
San Francisco, Cal.,
Seattle, Wash.

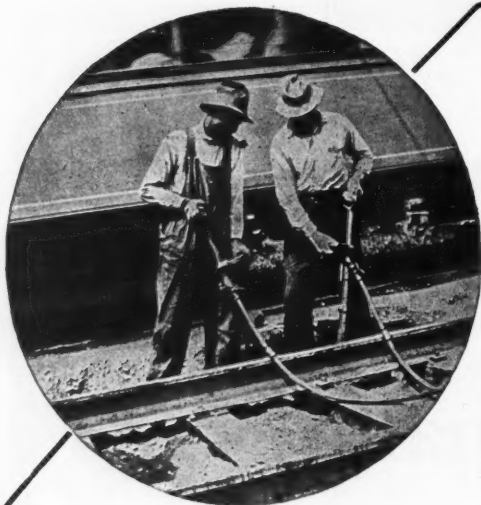
R. J. Cooper Co.,
Salt Lake City, Utah

J. E. Lewis & Co.,
Dallas, Texas.

Maurice Joy,
Philadelphia.

William H. Ziegler,
Minneapolis, Minn.





BULLETIN 9023 contains interesting data on the subject of pneumatic track tamping.

We will be glad to send a copy on request.

29-TT

Greater Permanence of Roadbed Easier Riding Track At a Lower Cost Per Mile

These are the problems for which the Railways have long sought a solution.

"IMPERIAL" TIE TAMPERS

have demonstrated their ability to effect these improvements.

They have been made a part of the permanent track maintenance equipment of many of the large railway lines of the country.

"Imperial" Tie Tampers will work effectively with any kind of ballast—on straight track, curves, switches, cross-overs, etc.

"Imperial" Tie Tampers are pneumatically operated by air from a special gasoline operated Compressor Car. Where signal air lines are installed, the Tampers can be operated from this source, without interfering with the signal service.

INGERSOLL - RAND COMPANY

11 Broadway, New York 165 Q. Victoria St., London

Offices the World Over



Barrett
Improved
Track
Jack
No. 1

Seventeen Different Styles and Sizes

The largest assortment of track jacks made by any one manufacturer—the result of nearly 35 years' experience in building lifting jacks for the leading foreign and American railroads.

BARRETT Track Jacks

Not only are they the fastest, lightest and most powerful in existence, but also cost the least for upkeep.

Our engineering department—the most comprehensive in the Lifting Jack world—is constantly designing special jacks for railroads whose conditions are individual.

Our handsome 150-page catalog describes over 200 different styles and sizes of lifting jacks. Send for your copy, today.

THE DUFF MFG. CO.

Established 1883 Pittsburgh, Pa.

50 Church St.
New York

Peoples Gas Bldg.
Chicago

Candler Bldg.
Atlanta



Barrett
Track
Jack
No. 17

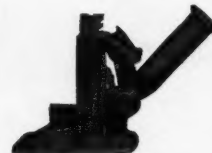


Barrett
Ballast
Gang
Track
Jack
No. 6

Special Barrett Surfacing Jack No. 227

For Third Rail Work

Single Acting



Three New and Improved Buda Jacks



Buda No. 201-B

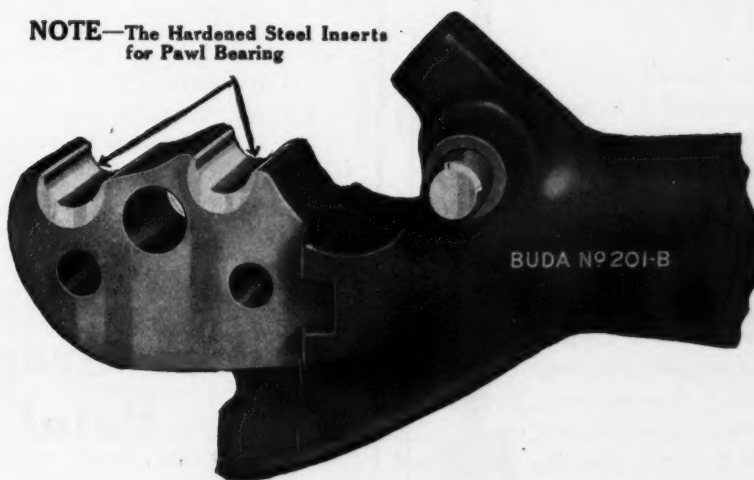


Buda No. 206-B



Buda No. 219-B

NOTE—The Hardened Steel Inserts
for Pawl Bearing



Improved socket lever as used in Buda Ratchet Jacks
Nos. 201-B and 206-B

SEND FOR BULLETIN NO. 277

THE BUDA COMPANY

New York

CHICAGO

St. Louis

Plain Back
SpadeLong Handle,
Diamond Point,
Socket Strap.

HUBBARD

Has stood for high standards, efficiency and real ultimate economy for over half a century.

All tools manufactured by us are guaranteed to be perfect in workmanship and material; if any prove defective in any way, prompt replacement will be made without charge.

Submit to us your blueprints or sketches of special tools and we will give you the benefit of our experience in designing them for your particular needs.

Write for Catalogues.

Plain Back
SpadeLong Handle,
Square Point,
Plain Strap.

HUBBARD & COMPANY
PITTSBURGH, PENNA.



Double End Track Wrench

Railway Maintenance Protective Painting

Six Points of Consideration

- 1—Not the first cost, but what is the final cost.
- 2—Which is the most economical paint per year of service.
- 3—Which is the best paint pigment to resist dampness, abrasion, acid attack, etc.
- 4—Which paint gives a guarantee of invariable quality, because made for over fifty years in ONE QUALITY only, the very best.
- 5—Which paint is standard on many of the leading railroads in the United States, Latin-America and abroad.
- 6—Which paint is a specialty of the manufacturer, using Nature's combination of the flake silica-graphite.

SOLVE your protective paint problems by using

Dixon's Silica-Graphite Paint

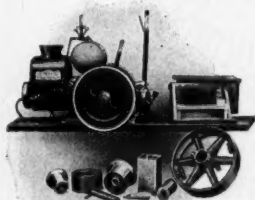
which possesses the above six qualities.

Write us regarding your special requirements and send for long service records and illustrated literature of value and interest to you.

Joseph Dixon Crucible Company
Jersey City, New Jersey

Established 1827

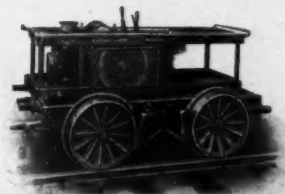
Now Is The Time To Prepare For Spring Track Work



FAIRMONT ENGINES

are used on 511 railroads in North, South and Central America. The thousands of letters we have received from satisfied users, telling of their reliability, economy and pulling power, proved them best for railroad work. Send for our testimonial folder.

Experience has taught you that the track, bridge and construction gangs must be well equipped when the rush of spring work begins. By equipping your hand cars with FAIRMONT ENGINES these gangs, with tools, materials, etc., can all be taken to the work IN ONE LOAD. Think of what a saving of time this means. On several railroads where Fairmonts are used they have saved thousands of dollars in one season.



MOTOR CARS SECTION

Fairmont Section motor cars are unequaled. They are easy to handle and give maximum power with minimum weight. These cars are made for every branch of track, bridge and construction work.

We are in a position to furnish cars for special purposes and to suit all conditions.



Two Popular Fairmont Products



FAIRMONT POWER DECK

Is the **original complete** power plant for converting old hand cars into modern motor cars.

There are no extras to buy. Engine, batteries, seats and deck are all assembled in one unit ready to set on the car and run.

This power plant has been on the market for the past five years and is considered standard on many railroads.

FAIRMONT FEATHERWEIGHT CAR

A speedy and light-weight inspection car. This is the car that attracted much favorable comment from railroad men at the Chicago Railway Appliance Show. **Because it was the only inspection car combining Power, comfort and light weight.**

Write for detailed information concerning this little car.

FAIRMONT GAS ENGINE & RY. MOTOR CAR CO.

FORMERLY FAIRMONT MACHINE CO.

423 N. MAIN ST.

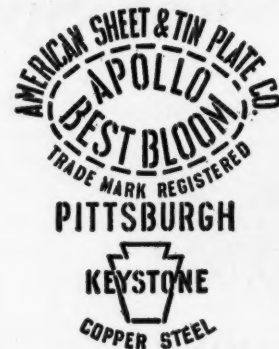
FAIRMONT, MINN.

For Culverts

The material that excels in service and rust-resistance is

APOLLO-KEYSTONE Galvanized Culvert Stock

Base made of *Keystone Copper Steel*, with a coating that's right—it sticks. Unequaled for Culverts, Tanks, Flumes, Roofings and similar uses. Specially adapted to the railroad field. Send for Keystone booklets.



Awarded **GRAND PRIZE** at the San Francisco Exposition for general excellence and greatest merit.

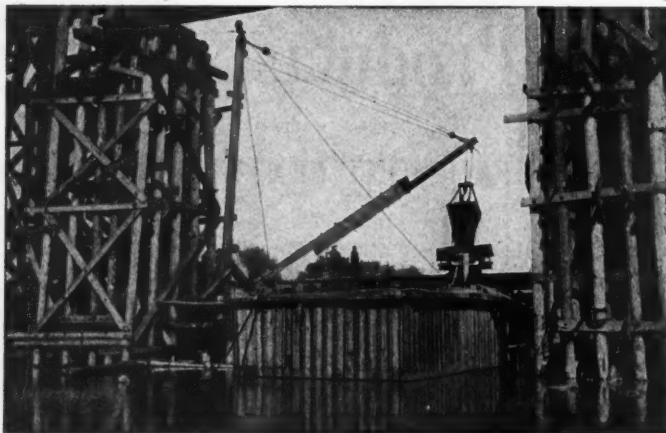
American Sheet and Tin Plate Company

GENERAL OFFICES: Frick Building, PITTSBURGH, PA.

DISTRICT SALES OFFICES:

Chicago Cincinnati Denver Detroit New Orleans New York Philadelphia Pittsburgh St. Louis
Export Representatives: UNITED STATES STEEL PRODUCTS COMPANY, New York City
Pacific Coast Representatives: UNITED STATES STEEL PRODUCTS COMPANY, San Francisco, Los Angeles, Portland, Seattle

Steel for Service



"I have been computing the amount of steel sheeting we have driven during the year 1913 on our work in the United States and Canada, and find that we have driven about 6500 tons or more than 350,000 lineal feet."

One contractor alone does not use 6500 tons of steel sheet piling in one year without very good reasons

Carnegie Steel Company

General Offices—Pittsburgh, Pa.

The cofferdams for the rebuilding of the Pennsylvania Lines West Bridge near Zanesville, Ohio, were constructed of

United States Steel Sheet Piling

by the Bates & Rogers Construction Company. Mr. E. Stanley Holland, Vice-President of the Company, writes as follows:

"The steel cofferdams were entirely successful and the engineers have expressed themselves as entirely satisfied with the methods employed and the expeditious way in which the work was handled.



E. H. Harriman once said, "I owe my success to two things. I've always worked hard and treated my men as I would want to be treated were I in their place."

He realized that only contented men make the best workmen.

And his men proved that he was right by helping him build up one of the greatest railway systems in the world.

Are your section gang men contented—and willing to give you a full day's work?

Or, are you still sending them to work on plain bearing hand cars—winded, fatigued and tired?

If so, you are losing money.

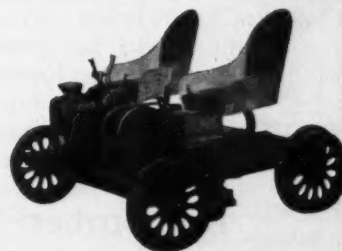
★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Then consider your motor cars, too.

Power costs money—and with the sky-high price of gasoline and lubricating oil, power becomes a mighty expensive factor.

Then why waste it to overcome the friction in plain bearings?

The superiority of Hyatt Roller Bearings has been recognized by every important manufacturer of railway section and inspection cars.



HYATT EQUIPPED "FEATHER-WEIGHT" INSPECTION CAR
manufactured by
Fairmont Gas Engine and Ry. Motor Car Company
Fairmont, Minnesota

The shock-absorbing and self-lubricating qualities of the Hyatt Bearing can be found in no other anti-friction bearing.

These features mean long life to your cars, and a great saving of money.

Let us send you Bulletin No. 1100. It explains in detail.

Hyatt Roller Bearing Co.,

Newark, N. J. 1105

Bearings sold on the service principle—Hyatt



NO magic elixir—unless the rapid destruction of those weeds which thrive along your right-of-way, and the banishment of those heavy expenses which have always been incidental with their destruction, can be called magic—chemical magic—that's all.

It's a case of "now you see 'em and now you don't," true, yet there is no magic, for the simple reason why clean tracks and lean expenditures are secured is the Sterling Sterilizing Efficiency of

TRACKOLINE "The Weed Killer"

Trackoline, the highly concentrated chemical, which does just what it was designed to accomplish, "*Kill every weed, top, root and seed*," which not only assures an absolutely clean track for the balance of the season, but greatly retards the growth of even the most hardy vegetation the following season.

Trackoline is guaranteed "*cattle proof*," that is, cattle will not eat the foliage to which it has been applied.

Remember—Labor is scarce, labor costs high.

- Grass and weeds are preparing for their rapid growth on that Right-of-Way of yours.
- There is a Mile of *Clean Track* in each barrel of



Send today for Trackoline Tracts or Facts on Clean Tracks and Lean Expenditure for the Prevention of Vegetation.

PROTECTIVE MATERIALS CORP.
Vanderbilt Bldg., 51 E. 42nd Street New York, N. Y.



How It Locks

Inside this Lock Nut is a hardened steel roller held in place by a protected mechanical arm. It is run on and tightened just as easily and quickly as a plain nut. Tendency to back off from vibration is prevented by the roller working against the eccentric wall with a cam action, forming a *positive lock*. To remove, heavy wrench pressure forces the roller into the small circular recess and the nut can be taken off without damaging the threads of the bolt.

Use These Nuts On Crossings, Frogs and Switches

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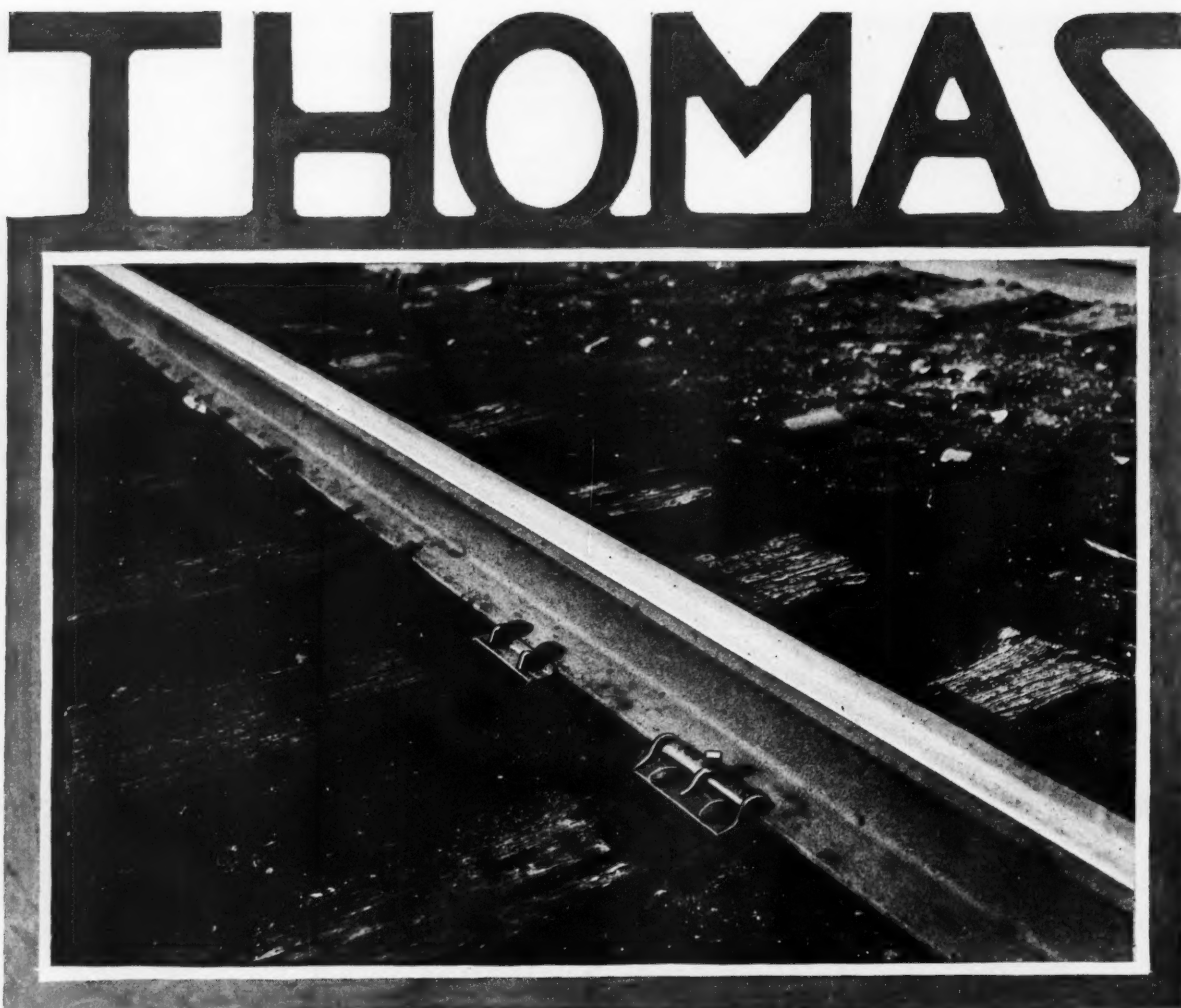
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Railway Maintenance Engineer

Volume 13

April, 1917

Number 4

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age Gazette* and *Railway Engineering and Maintenance of Way*.)

Published on the last Thursday preceding the date of issue by the
SIMMONS-BOARDMAN PUBLISHING CO.,
TRANSPORTATION BUILDING, CHICAGO, ILL.

NEW YORK: WOOLWORTH BLDG. CLEVELAND: CITIZENS' BLDG.
WASHINGTON: HOME LIFE BUILDING.
LONDON: QUEEN ANNE'S CHAMBERS, WESTMINSTER.

EDWARD A. SIMMONS, President. LUCIUS B. SHERMAN, Vice-President.
HENRY LEE, Vice-President and Treas. M. H. WIUM, Secretary

ELMER T. HOWSON, Editor.

WALTER S. LACHER, Managing Editor JOHN G. LITTLE, Associate Editor

Entered at the Post Office at Chicago, Ill., as mail matter of the second class.

Subscription price, including the twelve regular monthly issues of the *Railway Maintenance Engineer* and the four daily issues of the *Railway Age Gazette*, published in connection with the annual convention of the American Railway Engineering Association: United States, Canada and Mexico, \$1.00; foreign countries (excepting daily editions), \$2.00.

WE GUARANTEE that of this issue 8,100 copies were printed; that of these 8,100 copies, 7,400 were mailed to regular paid subscribers, 143 were mailed to advertisers, exchanges and correspondents, and 557 were provided for new subscribers, copies lost in the mails and office use.

The *Railway Maintenance Engineer* is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

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During years of severe labor shortage such as the present, the practice of allowing men more hours than they

The Truth

About Wage

Rates

This is a practice which deserves general condemnation. It is usually adopted when the supervising officer for one reason or another desires to keep from his associates or from neighboring lines the real wages he is paying. The purpose is, therefore, that of deception. As a matter of fact, such tactics do not long remain secret either among the laborers or employing officers, so that little advantage is gained. On the other hand, approval of or participation in such practices by supervising officers establishes precedents for laxness and irregularities in other respects of which some men are quick to take advantage and which may lead to other abuses which the officers cannot condone. With forces as large as those in the maintenance of way department and with the difficulty of adequate supervision of so widely scattered a force, one must be continually on the alert to prevent irregularities and abuses. Any tendency to overlook any form of irregularity should be studiously avoided.

It is economical to undertake maintenance of way work early any year; it is absolutely necessary this year if the

Delay

Will Be

Fatal

largest amount is to be completed. Previous to this spring the necessity (real or imaginary) of holding down expenses in this department until the close of the fiscal year on June 30 has prevented some roads from starting their programs as early as weather conditions permitted. This deterrent

no longer exists, for the fiscal year now corresponds with the calendar year. Therefore, there is not now any good reason for delaying work, while there is every reason for undertaking it at once. Although the demand for labor is greater than normal this season, this is only one consideration in favor of spring work. The more favorable weather conditions in April and May as compared with July and August can be measured in the amount of work performed per dollar of expenditure. The competition of the harvest fields late in the summer is another factor. Those in charge of the maintenance of way department owe it to their roads to impress these facts fully on their managements this year. With the unusual conditions existing now it is only by starting work early that a reasonable season's performance can be secured. Anyone who thinks that he can make up later in the season for the time lost now will be rudely disappointed when he undertakes his work. Start now!

We describe elsewhere in this issue the use of moving pictures among track men on the Pennsylvania to teach

Modern Educational Methods

them the safe and proper ways of performing their work. This same road has also inaugurated an Italian-English course for its track laborers. A somewhat similar English course and a Japanese-English course in track work were introduced on the Union Pacific about six years ago and the former has since been extended over other western roads. The commissioner of safety of the Santa Fe travels from gang to gang with an automobile fitted with flanged wheels, carrying with him a phonograph and records by means of which he conveys the message to the track men

on this road in their own languages. These are some of the ways in which modern appliances and methods are being utilized to teach maintenance of way employees not only the safe methods of performing work, but efficient methods as well. While much has already been accomplished in this way on a few roads, a comparison with the work still to be done throughout the country shows that only a small start has been made. Even with all the handicaps of transitory, indifferent and inefficient labor, if the results secured by such measures with the small proportion of the men who become interested are sufficient to compensate for the expenditure, it is worth while. These methods are in line with those adopted in the more progressive industries and they deserve serious consideration by the railways generally. Our labor problem is here to stay and its solution is dependent upon the extent to which the roads solve it themselves.

EFFICIENCY IN RECLAMATION

THE articles dealing with the reclamation of bridge and building materials appearing on another page of this issue constitute such an emphatic demonstration of the economies to be secured through the proper re-use of released structural materials that they require no amplification here. It is well, however, to call attention to the danger of excessive enthusiasm in the conduct of this work. As pointed out in some of these articles, it is necessary to keep careful accounts, for otherwise more money may be spent in securing the salvage than the reclaimed material is worth. Lumber sawed from decayed timbers, while appearing sound on the interior, may be infected with fungi which will produce decay within a few months. The drawing room expenses involved in the doubling-up or reassembling of old structural steel work because of the complications involved can easily run into an excessive amount of money. Serious thought must also be given to the equipping of the reclamation plant. There seems to be a general feeling that because such plants are used for the restoration of old material they must be constructed and outfitted with second-hand or discarded materials and equipment. Based on the broad principle that any work worth doing is worth doing efficiently, there is no reason why an old machine which has outlived its usefulness in some other shop should be of value in a reclamation plant. Rather, this equipment should be selected specifically for the work in view. In brief, the salvage of old or released material, to effect the desired economies, must be conducted with intelligence and due regard for costs.

UNIFORM TIE PRODUCTION

TIES deteriorate at a relatively uniform rate from year to year. If their renewal is made so as to compensate for this deterioration it should, therefore, be relatively uniform. However, one finds wide variations in the number of ties purchased from year to year, the number of ties bought by the railways of the United States in 1912 being 25,000,000, or 16 per cent less than in 1910, while the variations for individual lines were even greater. Similar figures for the last two years show an equal tendency in the opposite direction.

If ties could be produced over night the results of such wide fluctuations in the demand might not be serious. However, this is not the case, for, as pointed out in another column, an organization to produce ties cannot be perfected quickly, while the ties themselves require several months to season and to reach the point of use. When some of the largest tie producers do not cut a single tie during years of decreased consumption, but

fill their orders from their reserve stock on hand, it is not surprising that the roads are unable to secure largely increased numbers when they come into the market hurriedly and without previous notice. While some roads may perhaps be required to purchase such necessities as ties in a hand-to-mouth manner, most lines do not have to resort to such extremities. An increase in price is not the sole objection to fluctuating requirements, for price becomes a secondary consideration in times such as these when the demand for ties exceeds the available output. As a result the roads are not only required to pay more for their ties now, but in many instances are unwilling to wait the time necessary for the timber to season properly and are inserting ties in the track which will give a shorter life than if they were allowed to season properly.

While it may be advisable and even absolutely necessary for the roads to curtail improvements in the properties during times of business depression, it would appear that only a dire extremity should require them to retrench in maintenance expenditures to the extent of cutting down their tie requirements, for the deterioration not only continues regardless of business conditions, but the subsequent purchase of an adequate supply of ties of proper quality becomes impossible. Not only does uniform demand permit the greatest economy in production to be secured here as in other industries, but with ties it is only with such a uniform demand that the best material can be secured.

ORGANIZATION FOR CONCRETE WORK

A CONSIDERABLE difference of opinion exists as to the best form of organization of bridge and building forces for the conduct of concrete work. One view is that the regular gangs of bridge carpenters should do all concrete work that is not contracted. The other idea is to maintain a separate force, equipped to do all classes of concrete work and organized on a sufficiently flexible basis to do the smallest jobs as economically as the largest. In behalf of the first plan it can be said that it reduces the amount of travel and moving of the forces, since one gang, for example, will build a water tank complete from footing to roof. Another argument for this system is to be found in the fact that jobs involving only concrete work such as culverts cannot be finished entirely independent of the bridge carpenter forces, since the latter are ordinarily called upon to drive foundation piles and make all changes in the falsework that in any way involve the safety of train operation.

In answer to these arguments a number of important advantages can be claimed for the separate organization. Concrete work differs widely from that commonly done by the bridge carpenters. Very little skilled labor is required. In a gang of 12 men one good finisher, one or two form carpenters and a handy man are all who need to be above the grade of common laborers. In consequence the diversion of a gang of bridge carpenters to a concrete job involves the temporary use of skilled mechanics on work that can be done just as well by cheaper labor. This applies not only to the manual labor involved in the actual concrete work, but also to the foundation work, which on many concrete jobs may make up 50 per cent or more of the entire labor charge.

An obstacle to the combined organization will also be found in the distribution of equipment. Concrete work requires mixers, trench pumps, portable cement houses, wheel barrows, planking, blocking and other tools and supplies not used in work on buildings or wooden bridges. To supply complete outfits of this kind to gangs doing all classes of work means that this equipment will be idle a large part of the time. The usual answer to

this is that the bridge carpenters can put in small concrete jobs by mixing the concrete by hand, but the trend of present practice is to require the machine mixing of concrete in all cases for considerations of quality, if not economy.

An alternative in the case of the small concrete job is to use pre-cast units such as platform curbs, small building pedestals, interlocking pipe carrier foundations, etc., which are made at a central yard or purchased from a manufacturer. Leaving these small jobs out of consideration, the form of organization would seem to depend very largely upon the standards of maintenance and the local conditions on the road. In cases where only a very small amount of concrete work is done the combined organization is generally advisable, but where the proportion of concrete work is large, the preponderance of argument is in favor of a separate concrete gang.

WORK FOR MAINTENANCE ASSOCIATIONS

SUPERFICIAL consideration of the purpose of an organization like the American Railway Engineering Association could easily lead to the conclusion that its deliberations for nearly a score of years would lead to such a degree of standardization that there would remain little to occupy the time of its members and committees at this late day. The same thought applies equally to other maintenance of way organizations, but to all who are familiar with the work of these associations, this conclusion is known to be far from the fact.

Increase in the density of traffic and the weight of equipment, rising costs of materials and labor, and particularly developments in materials and devices, all introduce new factors that call for renewed investigations and continued study. The investigation of rails alone will occupy many years to come and while progress has been made as indicated by the decrease in the number of rail failures, complications arise from time to time that call for additional work on the part of the rail specialists. In the studies of the stresses in track and roadway only a beginning has been made, and although we cannot hope to reach conclusions that will make it possible to analyze the stresses in track by mathematical processes such as are used in the design of bridges, it is to be hoped that certain general principles will be evolved which will enable us to determine more intelligently that we can at present what the proper relation is between the weight of rail, the size and spacing of ties, the depth and nature of the ballast, etc. The need of a properly designed tie plate as one requisite to securing the maximum service from ties is generally appreciated, but the development of tie plates is so rapid at the present time that the designs made three years ago on some roads are now considered obsolete and are being replaced by new designs.

The increased use of washed gravel, either crushed or uncrushed, introduces a new form of ballast for which specifications and standards have not received general acceptance. Much work also remains to be done in the study of drainage. One of the most fertile fields for extended investigation is to be found in the development of labor-saving devices and in this may be seen the eventual solution of the labor problem—the substitution of skilled operators of mechanical tools for the unskilled labor employed to-day. Not only must efficient tools be developed, but standardization of performance must be carried out to insure the greatest returns for the money spent for the equipment and the labor employed to use it. Thus, instead of the work of the maintenance of way associations approaching completion, it is becoming more voluminous each year.

LETTERS TO THE EDITOR

DIPPING TRACK BOLTS IN TAR

UTRECHT, NETHERLANDS.

TO THE EDITOR:

The practice of oiling track bolts, as carried out on several railroads in the United States, is of interest to me in making comparisons with the methods used in the Netherlands to accomplish the same purpose. Our practice is to dip the shaft of the bolt in coal-tar just before it is put into place. The tar fills the threads and remains semi-fluid, and we have found it unnecessary to renew it as long as a bolt is in use. This, I believe, is one advantage over the practice of oiling. The tar prevents corrosion. Although it is necessary to tighten the bolts as before, they do not loosen so quickly as when the tar is not used. As the practice of oiling track bolts, as described in your columns, appears to have so many advantages, its adoption ought soon to become universal, but it would be interesting to know if the decision to oil track bolts on American railroads has been made with any knowledge of the use of tar for the same purpose.

K. DEN TEX.

SYSTEMATIZING TRACK MAINTENANCE

ST. JOHN'S, KAN.

TO THE EDITOR:

Successful track maintenance necessitates the handling of the various kinds of track work in a systematic manner. A foreman cannot carry on all classes of work simultaneously. A small section gang cannot surface and line track, cut weeds, clean ditches, repair fences, burn the right-of-way, tighten bolts, repair crossings, insert ties and tap down spikes at the same time with any degree of success. The proper procedure is to commence with a given class of work at some fixed point on the section and complete this work before starting something else.

Whenever an attempt is made to carry on too many kinds of work at once, much time is lost in changing from one job to another and in going to and from the hand car for different tools. Another disadvantage of this procedure is that the men do not work long enough at a single job to become thoroughly skillful and efficient at it. The program suggested below is based on personal experience and on observation of the work of others who are successful track maintenance men.

Begin at one end of the section early in the season and tighten all bolts. This work should be completed before commencing to spot and line the tracks because tight bolts will help to hold up the joints. Spotting and lining should also be carried through to completion in the same manner, doing whatever gaging is necessary, and tightening up any bolts that are found to be still loose. Ties should also be changed out while this work is being carried on. It is best to carry on these three classes of work simultaneously, since correct gage is necessary for proper alinement, and it is cheaper to change out ties while the tracks are open for tamping.

After this work has been completed it is usually time for the first weed cutting, which should also be handled in the same order, beginning at one end of the section. Surfacing and lining is, of course, the most important work in track maintenance and lasts from early spring until the track freezes up on the arrival of winter. All

other summer work must be done as time and conditions warrant, each being completed in turn. One exception to this is to straighten the toe-line of the ballast while weed cutting is in progress, since the toe-line is disturbed by pulling the weeds by hand along its edge.

Early in the fall it is necessary to have the track in such condition that the necessary time may be devoted to burning the right of way and a little later to ditching. The section foreman's maxim should be "Push your work and do not let it push you." By following this he will not need to worry about the cost, as that will take care of itself.

V. H. SHORE,

Section Foreman, Atchison, Topeka & Santa Fe.

THE "REVERSE" OF SCRAP RECLAMATION

DULUTH, MINN.

TO THE EDITOR:

Too much attention probably cannot be given to the railway scrap pile and to the economy of reclaiming material which is suitable to be reused. A wide range of excellent articles on this subject has recently appeared in the railway papers, especially since war prices so suddenly increased the costs and relative values of materials. Attention has been directed to many large savings made by various companies through the use of mechanical devices by ingenious workmen adept in the manufacture of economical substitutes for expensive railway necessities from articles reclaimed from the scrap pile. The handling, sorting and final disposition of scrap has also received a fair share of attention.

While in full accord with this campaign of education, may it not be wise, while watching the spigot, to consider also the bung? There are conditions under which scrap cannot be saved economically. Methods which result in economy on one railway may be false economy on another. The questions of debit and credit are largely individual questions, governed by circumstances which are as changeable as the markets. There is danger of overdoing the salvage of railway scrap as of any other good thing. The roadmaster who recognized his superior officer's find of three new track bolts in a scrap box as the same bolts for which two section men had hunted for three days, may have been more quick-witted than exact. But absurdly false economies along these lines are within the experience of almost every railway officer.

The reclaiming of wooden bridge materials is frequently a stumbling block not easily detected by the efficiency "inexpert." The members of a dismantled wooden bridge are usually far from new. Though showing decay only at the ends, these timbers still have served under load for a period of years. They have bolt and spike holes in them. There are frequently concealed decay spots and knots which make the resawed material much less desirable than would appear from the reclaimed stick. The stick must often be boxed before being resawed and the outside boards or slabs are of small value. The expenses of lifting, loading, transporting and handling to the saw are in most cases considerable.

There is the alternative of taking the saw to the timber and of rehandling only the reclaimed product in the form of lumber. This scheme sounds better than it really is, for it is usually expensive to supervise the work of employees who must be housed and fed while doing special work at a distance from headquarters. There are many cases in which it has been found ultimately cheaper to burn bridge timber where it falls than to try to put it to further use. Old buildings often have very small salvage value.

The transportation, rehandling, and overhead expense of salvage of scrap frequently totals a much greater expenditure than is apparent, even to those who should know. While the values of scrap metals have risen tremendously during the past year, so also has the value of labor, and of all items entering into the cost of reclamation. Scrap handling is by no means all profit, as any junk dealer will testify. Like every business, watchfulness of both sides of the ledger is necessary to success. Especially is it necessary in a railway organization, where it is not the only business in hand and where supervision is often divided among representatives of various departments not in close touch as to daily costs.

E. R. LEWIS,

Assistant to General Manager, Duluth, South Shore & Atlantic.

NEW BOOKS

Instructions to Locating Engineers. By F. Lavis, consulting engineer, New York City. 44 pages, illustrated, 6 in. by 9 in. Bound in cloth. Published by McGraw-Hill Book Company, 239 West 39th St., New York. Price \$1.00.

This volume constitutes the publication for general circulation, of instructions prepared by the author for use of field parties working under his direction in the United States, South America and China. The contents of the book may be divided into two classes. Instructions covering the clerical and administrative details of the conduct of a survey, purchase of supplies, administration of the camp, preparation of notes and reports, and a compilation of technical instructions and data which have to do with the actual location of the line. While much of the volume has to do with the conduct of surveys in new country it will also be found of value to the maintenance engineer who is occasionally responsible for the location surveys of grade revision lines or second track work.

Simplified Curve and Switch Work. By W. F. Rench, supervisor, Pennsylvania Railroad, Perryville, Md. 198 pages, 23 illustrations, 4½ in. by 6¾ in. Bound in cloth. Published by the Railway Educational Press, Chicago, Ill. Price \$1.50.

As the demand for greater refinement in the maintenance of track has become more general it has been necessary for foremen to give more attention to the maintenance of curves and switches. A number of excellent books have been prepared on this subject with mathematical solutions of these problems for the use of the trained engineer. This book is written for the use of foremen, although it does not resort to approximate rule-of-thumb practices, but presents accurate methods in a simple manner. The first seven chapters are devoted to curves, including a detailed description of the method of lining curves with a string, the maintenance of the proper superelevation, the importance of the spiral and the manner of laying out and maintaining vertical curves. The next five chapters are devoted to switch work and contain information of value to the foremen in the installation of switches. These chapters contain simple methods of determining the lead and other dimensions commonly used in laying out turnouts in addition to a number of practical kinks. Two chapters at the end of the book are devoted to the solution of a number of problems frequently encountered by track men.

The author of this book is well known to readers of the *Railway Maintenance Engineer* and its predecessor, the *Maintenance of Way Section of the Railway Age Gazette*, as a frequent contributor on track subjects. He is well qualified to write on such topics because of 25 years' experience in maintenance of way work on the Pennsylvania Railroad, much of the time in charge of important subdivisions on the high speed main line between New York and Washington.



FROM THE TREE TO THE TRACK

The Methods of Producing Ties in the Southern Timber Areas

BY A. H. NOYES,

Secretary and Treasurer, The Ayer & Lord Tie Co., Chicago Ill.



TO the uninterested person, a railroad cross tie means nothing beyond the fact that it is usually of wood, and is employed with rails, locomotives and cars to form a railroad. The section foreman, probably, is the first to appreciate the fact that a tie is a prime necessity and that the condition of his section depends largely on whether or not he secures a sufficient number of a proper grade to maintain his track adequately. The knowledge of the responsibility that a tie carries increases in importance gradually until it reaches certain officers who decide on the kind of material, the specifications governing the size and make, and the treatment.

The past 20 years has seen a wonderful change in the tie business. Prior to that time the weight of locomotives and rolling stock was light, traffic was frequent, and the tie of that day approached perfection in material. Compare these facts with present conditions. The weight of present day equipment, the density of traffic, the wear on ties from rock ballast, and last, but not least, the demand by the traveling public for a smooth track—all of these are factors contributing to an increased demand for high grade ties on a decreasing timber supply.

The organization necessary to conduct a tie-producing business is not necessarily complex. It is usual to have a general superintendent in charge of all producing operations; next under him and reporting to him are superintendents in control of certain territories, who in turn have foremen in charge of work on short sections of the river or rail territory whose duty it is to inspect, brand, spot and pay for all ties put out by small producers; to superintend timber work, inspect and hammer ties in the woods, arrange and pay for hauling, and all other work incidental to production and handling. These foremen make reports daily to the territory office, covering all payments made, and monthly statements showing the make and haul on timber jobs, and the number of ties purchased from small producers.

The superintendent is usually the one who estimates timber for tie purposes and recommends the purchase of boundaries. It requires a man with an intimate knowledge of timber and a thorough knowledge of the species available in his territory. In estimating, the figure used is the number of ties and not the feet board measure that a tract will make; the number of white oak, red oak, chestnut and soft wood ties being given separately. A careful estimate will not usually vary five per cent from the cut on the completion of a job.

For a number of years, the chief producing territory for commercial ties for the central states has been the Tennessee, Cumberland and Green rivers. The Ohio and Upper Mississippi rivers formerly were, but are no longer counted on for any considerable number. The

country drained by these rivers has been rich in a wonderful growth of timber. The tie timber has been plentiful and of excellent quality. These rivers, navigable for several hundred miles during seven months of the year (December until June) furnish a territory where handling is comparatively easy and ties can be produced and delivered for use in early spring work.

THE SUPPLY

Twenty years ago the hardwood tie question was a simple one. At that time white oak was the standard material; it was plentiful, of excellent quality and readily secured. Contracts could be made with reputable producers for a term of years at a set price with reasonable assurance that the required amount would be forthcoming as needed and, outside of the inspection of the ties at the point of loading, little time or anxiety was spent over the matter.

That there is a present shortage of white oak for ties may be better appreciated when it is known that the estimate placed on timber generally, without distinction as to locality, was 30 hewn 6-in. by 8-in. white oak ties per acre, and for many years only white oak was cut. There were many bodies of timber that would make largely in excess of this number; in fact, one post oak tree has been reported that has made 125 hewn 6-in. by 8-in.—8-ft. ties. To make such a number of ties a tree would have to be unusually large, long-bodied and with large, straight limbs yielding tie cuts, which is not usual.

Formerly, timber holdings for tie purposes were bought solely on a white oak estimate, and every white oak tree was worked into ties; today the value of white oak logs has increased to a point where it is poor business to work anything but the tops, twisting and small trees, into ties. The good white oak logs can be sold for veneer and furniture stock at a handsome increase over what they would bring in ties. The result is that while it is still possible to secure some white oak ties, the quantity is decreasing regularly, the grade of timber cut is of inferior quality, and the ties are uniformly smaller. In fact, the tie situation would be serious were white oak still exclusively demanded, but many kinds of timber suitable for tie purposes have been made available through chemical treatment. Red oak, owing to its strength, hardness and susceptibility to treatment, naturally was the first timber after white oak to be cut extensively, and it continues to furnish a large proportion of the ties used. Beech and gum are particularly adaptable for tie purposes and are gradually taking the place which belongs to them. These timbers lend themselves readily to chemical preservation and make ties that are lasting in service, both as to mechanical wear and freedom from rot. Elm, ash, sycamore, maple and various species of pine each contribute a certain per

cent of the treated tie output, but, aside from pine, are not extensively used.

Some hesitation is exhibited on the part of railroads in using ties cut of timber other than the oaks, but this is generally due to a lack of knowledge of the other treatment woods and of the long, valuable service to be secured from them. Of course, much depends on proper handling before treatment and careful preservation, but



HEWING OUT A TIE

this leads into another subject and one to be handled independently.

Formerly, many roads were able to secure their entire tie requirements from timber tributary to their own lines. Some roads still do so, while others find a part of their tie supply on their lines by utilizing nearly every species of timber and supplementing it from commercial territories. A larger number, however, are entirely dependent on outside supplies. It is reasonably safe to say that outside of those roads with lines in states south of the Ohio river, there are very few today that can supply their wants in hardwood ties entirely from their own lines.

Until 15 years ago the greater part of the ties used were hewn, and there was a regular class of labor known to the trade as "tie hackers," that followed this work from one section to another and from one tie job to an-

makers were little inclined to work timber that would not hew easily.

MAKING TIES.

The procedure where makers are working is about as follows: The makers usually work in pairs. The timber is stripped off, that is, lines are blazed through the timber, marking off boundaries to guard against interference among makers, each maker being required to work his area clean. The two men fell a tree and cut it into lengths, the standard length being 8 ft., after which one man proceeds to work out or hew the tie, helping in his turn to fell and cut a tree into lengths for his partner. In good timber, a maker can hew between 20 and 30 6-in. by 8-in. ties in a day; 25 ties being a good average day in and day out. The pay for making, per tie, varies from 10 to 18 cents, according to the run of timber; 10 cents being paid when the timber is thick, of good quality and the land offers a good lie, and the price gradually increasing as the grade of timber lowers, nothing being allowed for culls.

In making by hand, the ties are allowed to lie in the woods until the woods foreman has inspected and branded the ends; sawed ties are inspected in the mill yard. In either case all making is paid immediately after each inspection. Hewn ties, after inspection, are cribbed open off the ground and left until they can be hauled, or in rough land, snaked out of the timber to be yarded on wagon roads.

PORTABLE SAW MILLS.

While tie-makers were easily secured little timber was sawed, and generally where sawed ties were produced they were rather the by-product of hardwood mills that cut their off logs or tops into ties to save timber. They were rarely produced by mills set for tie cutting exclusively. During this period, too, there was decided opposition among railroad men to sawed ties, some holding that sawed ties rotted more quickly than hewn because the saw-cut exposed the end fibers of the timber and caused greater absorption of moisture, which induced decay. Whether this contention was well founded has



COLLECTING TIES INTO RAFTS

other in sufficient numbers to produce the bulk of the ties made. At that time timber in large tracts which was being worked for ties was of sufficient quantity to offer steady and paying employment for this class of labor. Virgin timber lends itself readily to hewing, although, of course, there was always a certain percentage of twisting timber in every tract that was passed over as useless. "Bucking" a tie out of a twisting stick took too much time and seldom produced one that would grade No. 1, and as nothing was paid for culls, naturally tie-



BRINGING TIES TO THE RIVER

not been proven; nevertheless, the opinion held and sawed ties were seldom used in quantity.

This condition, too, has changed; sawing ties at portable mills has become more common, and eventually the majority of ties produced will be from small mills. In logging it is the practice, particularly in small timber, to decide whether a tree will make a 6-in. by 6-in.—8-ft. or 7-in. by 8-in.—8½-ft. tie, and to cut the logs into 2 or 8½-ft. or multiple lengths, according to the size tie that each log will make. It takes two teams to log a mill,

figuring the length of haul from a turn around at a quarter mile. Logs are seldom cut to exceed 17 ft. in length for hauling and butted to tie length at the mill yard.

The idea prompting the use of portable mills is that it is cheaper and simpler to move a mill to the timber than it is to haul the logs long distances to the mill, and for this reason frequent settings are made; the logs are parked at the mill site, and after 20 to 30 acres of timber are cut off the mill is moved to another set. An average cut for a tie mill is 150 ties per day. Tie siding is usually cut into 1-in. boards, which bring about \$12 per M at the mill yard and are used for cheap furniture stock.

In making ties, either by hewing or sawing, it invariably works to the best advantage when both 6-in. by 8-in. and 7-in. by 8-in. ties are required. In cutting timber many trees will make one 7-in. by 8-in. tie to a cut without much waste, whereas were 6-in. by 8-in. ties only wanted there would be considerable timber wasted. Contrary to the general impression, the larger proportion of the trees in tie timber yield only four ties or less to the cut. Four ties to a cut produce what are generally called quarter

ties are made up in single layers. Each tie is nailed on both ends to nailing strips of split saplings. Rafts vary in size from 500 to 25,000 ties. Two men usually run a raft and live aboard it most of the time, generally tying the raft up at night. An 800-mile run will take from two to three weeks or more, according to the stage of the river and the current. The pay for rafting as well as all other labor in tie production and handling is by the piece, and varies from 4 to 18 cents per tie, according to the distance. It is needless to say that the loss hazard of long runs is such that when possible they are avoided, the ties being taken out of the river and loaded into barges at points where navigation is possible and the distance reduced in this way.

Barges for tie-loading are mere boxes, standard Pittsburgh coal barges 26 ft. by 135 ft. by 8 ft. being used. Stern-wheel river steamers push four to eight barges up stream empty and make frequent landings on the trip out, loading ties direct from the banks. Oregon fir barges, loading to 6 ft. on a good stage of water, will hold as many as 8,000 ties to the barge, or 48,000 ties to a tow of 6 barges. The average time for a trip is 10



TRANSFERRING TIES FROM BARGE TO CAR

A SMALL SAW MILL

A TIE CHUTE

ties, where one face is of less than full dimension. It is seldom that three ties are worked out of one cut, although that is possible. When this is done there are generally two 6-in. by 8-in. and one 7-in. by 8-in. ties produced, or vice versa. Two ties to a cut produce what are known as half-moon ties, while one tie to a cut is a pole tie, and, unless squared up, will have two rounded sides and faces scant of the greatest diameter of the stick. The number of tie cuts to a tree vary greatly, climatic and soil conditions being responsible for the variation in growth.

TRANSPORTATION.

The hauling of the ties from timber yards to the river or railroad is the most uninteresting part of the journey. The loads vary from 10 to 20 ties, according to the roughness of the country and the roads, 15 ties being the usual average. Hauls as long as 25 miles over rough country are not unusual. In a haul of this distance it usually takes three days to make the round trip. As the demand for ties increases it is necessary to go farther back to find the timber. Ties are being produced today in sections that were considered impossible 15 years ago. Certain territories are now worked that have no railroad nearer than 75 miles. In these instances the ties are produced on the upper reaches of some of the large rivers, or their tributaries, and are rafted and run out during the winter when there is high water. In order that the rafts will float, the ties are yarded until seasoned, often on dry branches that hold no water except during the winter. When a sufficient stage of water comes, or a tide as it is called, the ties are rafted in small batches or run out loose and held at the creek mouth by booms and there made into rafts. In rafting for long distances the ties are usually two to four deep, but for short runs

days, working 24 hours and double crews when running up light and out with a tow.

Tie handling generally throughout the South is done with negro labor. Towboats carry quarter-boats for the crew of tie carriers. The number of hands varies according to the size of the tow and the number of ties to be loaded, 18 to 21 men in a tie crew being usual. On making a landing, chutes are rigged up the bank with one end near the tie piles to facilitate handling, and the other in the barges, where the ties are arranged as fast as they come aboard. Where yards are large, a tow can be loaded out in a comparatively short time, the only delay being in shifting the chutes, but when many landings are made and only few ties are secured at a landing the time needed to complete a tow is necessarily increased.

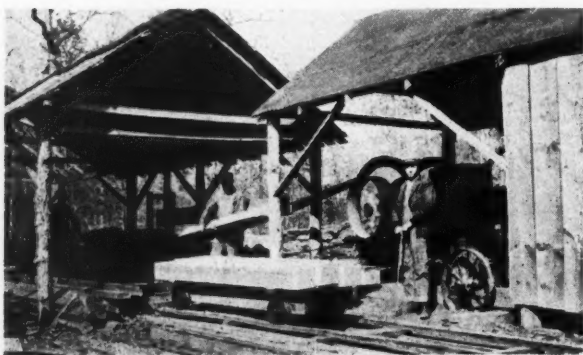
Unloading from the barges to cars is all done by hand. Negroes shoulder the ties, one man to a tie, and pass inspectors, who grade them, the accepted ties going directly into cars for shipment and the rejected ones to the yard for handling and storage. The pay for handling out of barges into cars for shipment is 1½ cents on 6-in. by 8-in. and 2 cents on 7-in. by 8-in. ties, and yarding from 1 cent to 2 cents, according to the length of carry and the size of the tie.

EVILS OF IRREGULAR TIE PRODUCTION.

There are certain facts in connection with the production of railroad ties, as seen by the producer, that rarely strike the railroad officer with the importance that they deserve, and it would be well if they were given more serious consideration. The capacity possible in tie production is limited, not only in so far as the available timber supply is concerned, but equally so as to the labor

necessary in making, logging and hauling. The country best suited for the growth of hardwood timber is not that best suited for farming. If it were, the timber supply would have gone many years ago and the land would have been cleared for agriculture. The very fact that a certain section is a heavy tie-producing territory means that the population is sparse and that the number of teams as well as hands are limited, and it necessarily follows that work in the timber must be continuous if a steady supply of ties is to be secured.

During 1913 and 1914 the railroads retrenched all along the line, and ties were one material to suffer.



SAWING TIES AT A MILL

During that period, and for part of 1915, many of the largest tie-producing companies stopped making, and for two years not an axe was put into their timber. The usual stock of ties was allowed to decrease to a minimum and current wants were secured from the small producer, who was forced to cut his timber to supply his family with flour, meat and other necessities.

Eighteen months ago the railroads not only resumed their normal buying, but greatly augmented their demands for ties to rehabilitate the tracks that had been allowed to deteriorate during the period of depression. As a result, they rapidly absorbed the small stocks that remained. The two years lost in production owing to the lack of demand for ties were gone without hope of recovery, and today sees the country with an abnormal demand and no surplus ties in stock, while a depleted organization to cope with the pressing need does not give promise for immediate improvement. The offer of an advance in price will do little or nothing to bring out more ties, and, as is usual in a time like this, has but the effect of raising the price and lowering the grade.

It takes about a year to season a red oak tie properly for chemical preservation. A tie may be given treatment in less time; that is, a given amount of chemical can be injected into the timber, but the penetration secured is not thorough and the distribution is not sufficiently uniform to give the best results. It is important that ties treated with chemical salts be allowed to season after treatment, but it is doubly important that the ties be allowed to season before treatment. Preliminary seasoning is of even greater importance when creosote oil is used, as ties are generally given an empty-cell treatment, and green timber cannot be treated successfully by this method. It will be seen, therefore, that any attempt to treat partially-seasoned or green timber is bound to bring unsatisfactory results, and should be guarded against.

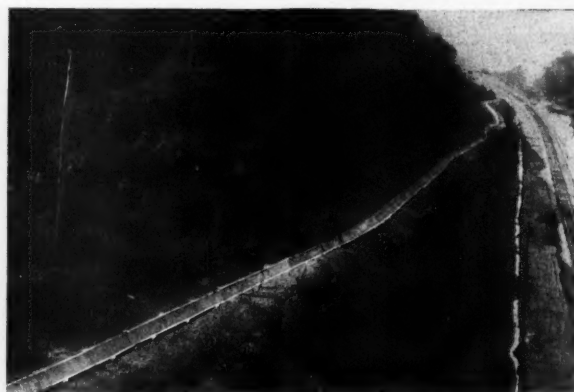
To the writer's knowledge, some roads are always in the market for ties regardless of the condition of general business, and they are the only roads that go into a period of shortage, such as now exists, with their track

in proper condition and the future provided for. There has not been a dull spell in the past 15 years that has not been followed with a period of tie shortage, and invariably the shortage has been supplied with inferior material at high prices. Regularly anticipated requirements will always assure a future supply of good material at a reasonable price, but any failure to provide for future needs is bound to court a shortage that will be followed by an attempt to fill up at a maximum cost with low-grade material.

The railroad that anticipates its tie requirements regularly and lets its wants be known to some reputable tie producer, yearly in advance, seldom needs for ties. It is the practice to protect roads that follow this rule and to carry a stock of ties for them. On the other hand, the road that takes a maximum number of ties one year and a minimum the next is too uncertain to figure on and few tie companies will risk carrying a stock to cover their fluctuating wants. To figure a safe mean, and to be regular buyers for that number, will invariably assure a railroad sufficient material properly produced and of proper quality.

A HALF-PIPE CONCRETE FLUME

ONE of the interesting features of work incidental to the construction of Stuart tunnel, just east of Magnolia, W. Va., on the Magnolia cut-off of the Baltimore & Ohio, was the method employed in disposing of drainage just west of the tunnel on the south side of the tracks. Opposite the west portal of the tunnel two ravines converge at a height of 32 ft. above the tracks. In dry seasons no water is discharged, but after rains the flow is considerable. To provide a suitable and efficient water way at a reasonable cost, a flume was constructed from the confluence of the two ravines, westwardly along the face of the cut for a distance of 1,400 ft., after which the water is carried under



A LONG FLUME

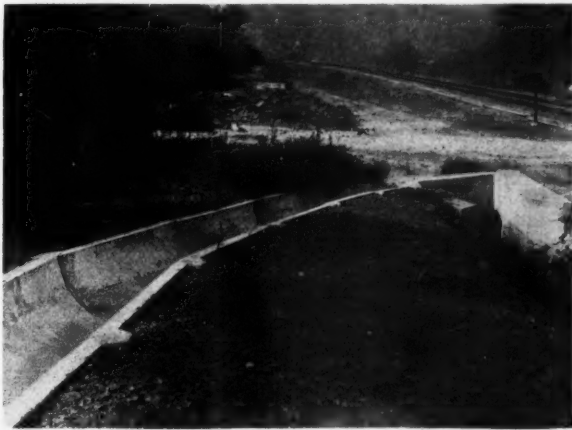
the tracks by means of a culvert, to an open ditch. The approach cut is in soft shale.

The flume consists of half pipes with 36-in. inside horizontal diameter made of reinforced concrete. The sections are 8 ft. long, and semi-circular in shape, with walls 4 in. thick. The ends are formed upon the same principle as bell and spigot end cast iron pipe.

The soft shale was considered sufficiently stable to make a special foundation unnecessary. Part of the flume was laid flush with the surface of the ground, and part was laid on the surface with the loose shale piled up against the bottom and sides of the flume.

The total fall in the entire length of 1,400 ft. is 32

ft., an average fall of 2.29 per cent. To avoid unnecessary excavation, the flume was not laid to a uniform grade, but follows the contour of the face of the cut. It was necessary to vary the alinement for the same reason.



A CLOSE VIEW OF THE OUTLET

The heavy grade and smooth surface of the flume are of value in taking care of the flow.

At the upper end of the flume a concrete head wall was constructed. At two places where it was necessary

to build the flume close to the edge of the cut for distances of 16 ft. and 54 ft., respectively, light concrete supporting walls 10 in. thick were constructed.

The half pipe were supplied by the C. F. Massey Company, Chicago, and were installed by the maintenance of way department forces of the railroad. The sections were carefully laid to proper grade and the joints were grouted with cement. Work was commenced in May, 1915, and completed in July of the same year.

An inspection made January 25, 1917, shows that practically all of the grouted joints are slightly cracked, but not to the extent of affecting the efficiency of the flume. Twelve of the sections show other cracks, only two of which are cracked to an appreciable extent. These two pieces were damaged in handling and were repaired when placed, with cement grout. No vertical or lateral settlement has occurred and no repairs have been necessary since the completion of the work.

The flume is in excellent condition and has properly performed its functions.

The cost of this construction was as follows:

			Cost Per Ft.
1,400 lin. ft. 36 in. half pipe at \$1.40...	\$1,960.00		
Cement, etc., for supporting walls and grout	150.12	\$2,110.12	\$1.51
Labor		1,583.61	1.13
		<u>\$3,693.73</u>	<u>\$2.64</u>

We are indebted to Earl Stimson, engineer maintenance of way, of the Baltimore & Ohio, for the above information.

Stopping Leaks Under a Dam by Grouting

THE Lehigh Valley recently completed the construction of a dam near Lehigh, Pa., in connection with improvements to its locomotive water supply at that point. This work is of special interest because of the difficulties that arose from the faulted sub-strata encountered and the means employed to overcome them. The dam consists of an earth embankment 12 ft. wide on top having a maximum height of 22 ft. A spillway with its concrete discharge channel was placed on the natural soil at the north end of the dam.

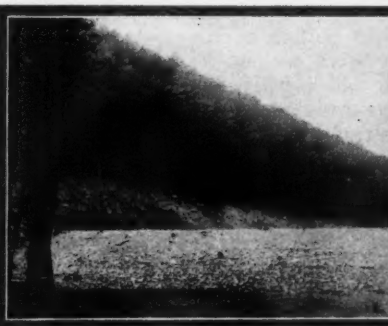
The embankment was made from clayey material pro-

of 1-2-4 concrete 12 in. thick. The project also involved moving a highway that formerly lay at the foot of the hill adjoining the dam on the south, to a new location on the hillside above the level of the dam.

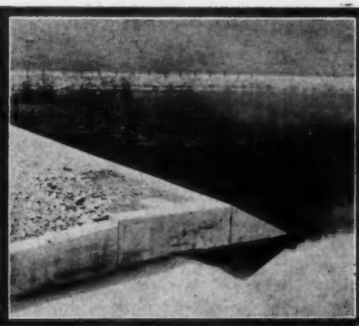
The construction was complicated by the underlying rock formation, the top of which is generally from six to eight feet below the surface of the ground but lies deeper under the north hill and outcrops on the south hill. The rock is a shaley sandstone with frequent mud-filled seams whose natural bed is nearly vertical and parallel to the general trend of the valley.



THE CONCRETE SPILLWAY



THE DRY STONE PAVING ON THE
LOWER FACE OF THE DAM



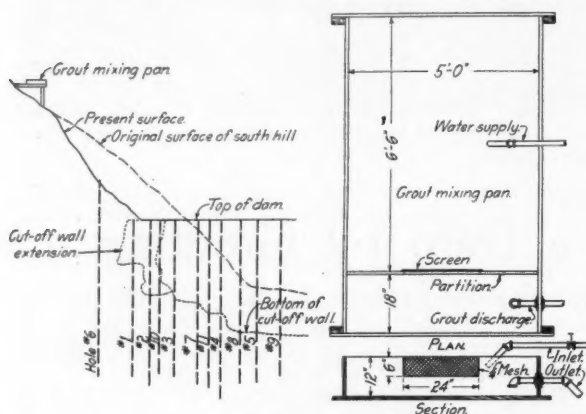
THE RESERVOIR WITH THE SPILL-
WAY AND DAM IN THE
FOREGROUND

cured from the hill adjoining the site of the dam on the north, thoroughly wetted when placed and rolled in thin layers. It was formed with 2 to 1 slopes on both up-stream and down-stream faces. The top of the dam and the down-stream slope were protected with a 12-in. layer of dry stone paving and the up-stream slope with a paving

A cut-off trench, varying from 30 in. to 36 in. wide, was dug at the foot of the up-stream slope of the dam, generally extending but a short distance into the underlying rock, but where a faulted strata was encountered as under the south hill the trench excavation was carried deeper until what appears to be a fairly solid rock was

found. Throughout the length of this trench holes six to eight feet deep and about eight feet apart were drilled by hand and grout was forced into them with a small hand force pump. All of these holes became tight after receiving four bags or less of cement in the shape of a thin grout and it was thought that the sub-strata would be amply tight for the light water pressure to which they would be subjected. The filling of the trench with concrete therefore was allowed to proceed immediately and later this cut-off wall was joined to the concrete facing of the up-stream slope.

When the reservoir was filled the dam itself proved to be water tight but four small springs appeared at the foot of the south hill between the bottom of the dam and a point about 200 ft. down stream. The combined flow of these springs when the reservoir was full was about 200,000 gal. per day. An attempt was made to locate the source of the leakage by the use of aniline dyes at certain points in the reservoir without success. As it was felt that the path of the leakage was through the south hill, either under or around the end of the cut-off wall where the rock was more or less faulted, the



CROSS SECTION OF THE DAM THE GROUT MIXING PAN

cut-off trench was extended a short distance into the hillside and then filled with concrete. This attempt at stoppage was unsuccessful as the leakage continued undiminished when the reservoir was refilled.

It was anticipated that this might be the case and two 5-in. wrought pipes extending from the bottom of the excavation to the top of the concrete were cast in the extension of the cut-off wall when it was constructed. These pipes were placed in the concrete to serve as parts of drill holes and were about six feet apart as it was believed that, if the extension of the cut-off wall was not efficacious in stopping the leakage the only remaining hope was to drill deep holes and insert grout.

After it was found that the extension of the cut-off walls did not stop the leakage a steam well drilling outfit with a 4-in. bit was secured and set up over the first pipe. The hole was carried down to a depth of 40 ft. below the top of the wall where a very hard and solid rock was encountered. The first intimation of success came when this hole was about 35 ft. deep, at which time the muddy water which had been in the drill hole quickly lowered and later the springs became slightly turbid. When tested with aniline dye the spring showed the color of the dye in about one hour after it was poured into the drill hole, indicating a slight flow of water and a water bearing stratum.

The drilling was then continued, holes being put down through the south end of the cut-off wall to a depth of 35 to 45 ft. on close centers in the order indicated in

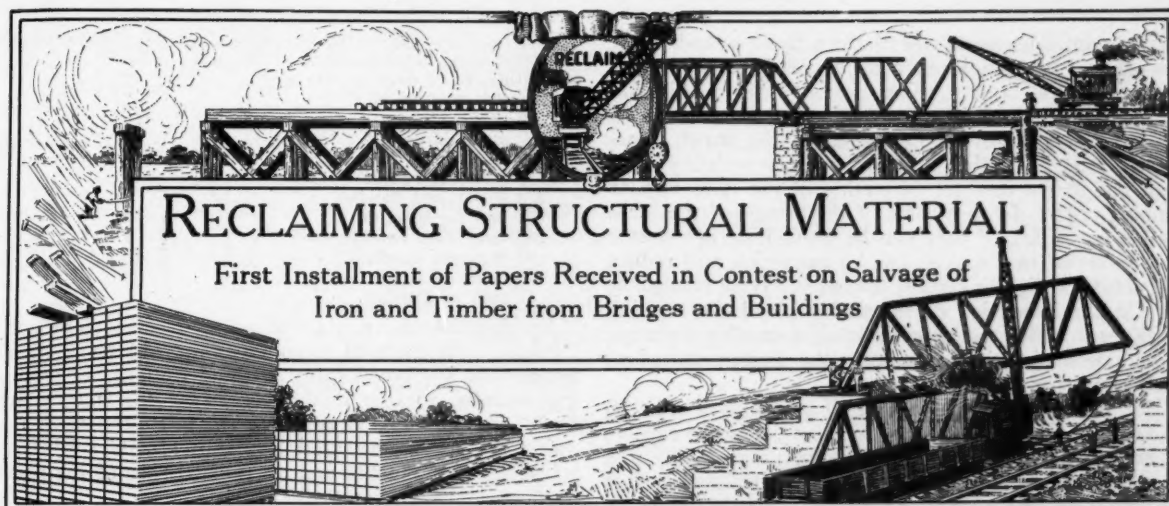
the accompanying diagram. Hole No. 10 was drilled along side hole No. 2, because the latter seemed to have been stopped by the grouting of No. 1 and hole No. 11, the final hole, was drilled between No. 7 and No. 4 because the latter had taken the most grout and therefore indicated the largest cavity. When the fourth hole was being drilled grouting was commenced at the first hole, each hole being thoroughly flushed out with clear water before the grout was admitted. The grouting was done in the same order as the drilling and during a time that the reservoir was filled. A very thin grout was used, and, as it was desirable to do the work without pumping, thus eliminating the usual difficulties with cement-clogged valves, it was decided to feed the grout into the holes by gravity. Accordingly, a shallow wooden mixing pan was constructed on the hillside above the level of the dam and means were provided for hoisting cement in bags to a storage platform located alongside. A gasoline-driven force pump was set up on the top of the dam that pumped water at the rate of 50 gal. per min. or less as required, thus controlling the consistency of the grout, which was kept constantly agitated by the force of the incoming water and a man with an ordinary hoe. The rate of incoming water was regulated by hand according to the ability of the drill hole to carry off the grout, which varied and became very slow as the hole approached tightness. The grout was fed into the drill holes through a wrought iron pipe fitted into the top of each hole and connected to the discharge pipe from the mixer pan. The amount of cement taken by each hole is shown below:

No of Hole.	Bags of Cement.
1	37
2	5
3	48
4	134
5	68
6	132
7	90
8	79
9	3
10	113
11	3
Total	712

The success of the method is shown by the results, as the leakage which had amounted to 200,000 gal. per day from the four springs was entirely stopped. The total leakage when the dam was completed as measured on a weir in the creek channel below the dam is only 6,000 gal. per day. The entire work was done by railroad forces under the general direction of G. L. Moore, engineer maintenance of way, and under the immediate supervision of D. L. Waters, hydraulic engineer, to whom we are indebted for the above information.

SOUTHERN PACIFIC PREMIUMS AWARDED

THE Southern Pacific (Pacific System) has just made public the results of its annual inspection last fall, in which the Sacramento division received the highest rating, 92.72. B. Roland, roadmaster of the Suisun district of the Western division, received the gold medal for the best roadmasters' district with a score of 96.04, and J. Mullen, foreman of Section No. 5 of the San Jose district of the Coast division, received the gold medal for the best section with a score of 98.20. Silver medals were awarded to the 48 section foremen having the best section on their roadmasters' districts, to 82 agents whose stations received perfect ratings, to the pumpers of 28 pumping stations for perfect pump houses, to 13 pumpers of fuel oil plants for perfect fuel oil plants, and to 12 engineers of power plants for perfect power plants.



EIGHT contributions were received in the contest on the Reclamation of Bridge and Building Materials, which closed on January 10. These papers were submitted to A. F. Robinson, bridge engineer, Atchison, Topeka & Santa Fe; W. A. Summerhays, general storekeeper, Illinois Central, and G. A. Haggander, bridge engineer, Chicago, Burlington & Quincy, who awarded the first prize to C. A. Lichty, general inspector in the purchasing department of the Chicago & North-Western, Chicago, Ill., and the second prize to J. T. Andrews, assistant engineer, Baltimore & Ohio, Baltimore, Md. Other contributors to this contest were G. L. Moore, engineer maintenance of way, Lehigh Valley, South Bethlehem, Pa.; S. J. Corey, chief draftsman, bridge department, Chicago, Rock Island & Pacific, Chicago, Ill.; Deland Clapper, assistant engineer, Duluth & Iron Range, Duluth, Minn.; George H. Richards, superintendent bridge and building shops, Chicago, Milwaukee & St. Paul, Tomah, Wis.; H. H. Brooke, general foreman bridge and building department, St. Louis-San Francisco, Chaffee, Mo., and J. C. Ellison, roadmaster, St. Louis, Iron Mountain & Southern, Wynne, Ark.

FIRST PRIZE THE RECLAMATION OF LUMBER

BY C. A. LICHTY

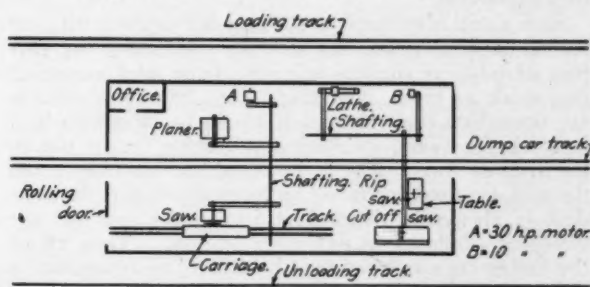
Purchasing Department, Chicago & North-Western, Chicago, Ill.

Only a few years ago a great deal of the second-hand material from wooden bridges on railroads was used for making box culverts under tracks and highway approaches, for back walls for trestles and for all manner of curbing, retaining walls, platforms, walks, etc. Since culvert pipe and concrete have proven so much more permanent and far more economical for the purposes named, and as some of the better grades of old bridge timbers are accumulating in large quantities—much of which is far too good for any of the uses mentioned above—it has become a problem to dispose of these to the best advantage and with as little loss as possible.

Some of the railroads at first began in a crude manner to rip this class of material into smaller sizes, using it as a substitute for new lumber. When it was found that this class of material was superior to some grades of smaller dimension lumber purchased new in the market, it was not difficult to convince the managements that it was good policy to construct small mills where such timbers could be gathered together conveniently to be cut up into the sizes that were in everyday demand. For

reasons that are apparent, it is more desirable to have a few mills, well located, than to have a mill on each division, chief among which is the fact that one well organized crew will handle the work to better advantage than several crews working at it only a part of the time. A crew having charge of a material yard can handle such a plant to good advantage in connection with its other work, and in loading out material can often fill small orders from the stock of second-hand material that would otherwise have to be taken from new stock.

The building for such a plant need not be expensive; in fact, nearly all of the material for its construction can be derived from odds and ends left over from other structures or from second-hand lumber. Old bridge ties set four feet apart with a 2-in. by 4-in. between for studs, make a substantial frame. Trusses 8 ft. apart in the roof, constructed of 3-ply 2-in. by 8-in. material,



PLAN OF A TIMBER RECLAMATION PLANT

will obviate the need of posts in the building, and add sufficient rigidity to the frame to carry the necessary amount of shafting without excessive vibration. The size of the building will depend entirely upon the amount of machinery to be installed and the work to be performed. In general a mill to contain a variable speed "pony saw" with a movable carriage, and a planer, cut-off saw, table rip saw and a lathe should be about 40 ft. wide, and from 60 to 80 ft. long.

The first consideration for such a plant is the power. Where electricity is available it is the best. If adjacent to any other plant equipped with power, cable transmission may be employed. A separate steam plant for the operation of such a mill is not economical.

There are a number of firms that make "pony mills" suitable for sawing all kinds of material up to 18 in. in thickness, the length of the carriage track depending on

the maximum length of the timbers to be sawed. The saws should be 44 in. in diameter, 8 or 9 gage, and of the "inserted-tooth" type, which permits the substitution of a new set of teeth in a few moments whenever break-ages occur through striking metal in the wood, overlooked in the inspection. Seldom is a saw so badly damaged but that a new set of teeth will put it in regular running order. In case come of the prongs of the sockets become damaged they can be welded, or in extreme cases a set of new sockets can be cut which will reduce the saw to a slightly smaller diameter. With reasonable care in the inspection of the timbers, and the running of the saw under the supervision of a capable foreman, three saw blades should perform the work required of such a mill for years.

The planer should be capable of surfacing a stick 10 or 12 in. in thickness. The cut-off saw should be capable of sawing the ordinary sizes of lumber, and the rip saw should be of the table type, having several different sizes of blades to suit varying conditions. These should be the ordinary circle saws.

The products from such a mill are almost innumerable and depend on the kind of material available and the stock most in demand. Fir bridge stringers may be badly split or the ends decayed. Yet material may be sawed from them which is entirely fit for the best interior work. By the aid of the reclamation mill, old bridge timbers can be converted into any of the smaller sizes which may be used in the construction of the smaller-sized buildings and such articles as signal stakes, car stakes, engineer's ballast, grade and slope stakes, concrete form lumber, stock yard repairs and much of the smaller material used at division shops by carpenters for all sorts of repairs and construction work. Oak, elm and maple pile heads are sawed into material suitable for lathe work, to be turned into handcar, canthook, lug and jack handles, while if cedar pile heads are collected in sufficient numbers, cedar shingles may be cut at a very reasonable cost.

Such a mill is economical not only for working up good second-hand material, but also for converting the surplus of odd-size timbers left over from such construction work as tanks, coal sheds, etc., into sizes suitable for immediate use, whereas it would be otherwise held in stock for years, awaiting opportunity for its use in the original form. The scrap wood and shavings from the mill are used for firing up locomotives and the sawdust is always in demand at ice houses and for the sweeping of floors in passenger stations. Thus all of the timber on a railroad may be utilized as economically as are the by-products of the modern packing house.

The Chicago & North-Western Railway has two such reclamation mills which have been in service for 7 or 8 years, one located at Boone, Iowa, and the other at Winona, Minn. The mill at Boone is under the same roof and is operated by the same crew that handles the sawing and drilling of second-hand steel rails. During one season the reclamation mill at Boone manufactured from second-hand bridge material and other timbers the following:

625,800 ft. of dimension lumber.
164,500 cedar shingles.
3,736 4-ft. signal stakes.
8,356 slope stakes.
4,400 ballast stakes.
1,440 grade stakes.
10,350 gravel car stakes.
210 bridge number posts.
1,720 bridge number boards.
33,000 track shims.
300 tapered ties.
97,150 paving blocks.

78,000 lin. ft. of grain strips.
13,000 running board saddles.
3,700 lin. ft. of quarter rounds.
87 oak crossing ties.
1,900 maple wedges.
400 maple blocks (for blocking).
520 wheel blocks.
1,673 6-ft. jack handles.
300 4½-ft. jack handles.
400 handcar handles.
240 cant hook handles.
95 lug hook handles.
675 cords of engine wood.
15 cars of sawdust.

Besides the above, the following articles were constructed with material from the mill: 314 track drain boxes, 114 stockyard gates, 69 feed troughs, 42 watering troughs, 56 feed bunks, 175 bunks for cars, water tanks, chute aprons, ladders, etc. A fair estimate of the value of the above material is approximately \$21,000, while the cost of labor and the maintenance of the plant amounted to less than \$8,000.

SECOND PRIZE

RECLAIMING OLD STEEL BRIDGES

By J. T. ANDREWS

Assistant Engineer, Baltimore & Ohio, Baltimore, Md.

The reclamation of old bridge material on the Baltimore & Ohio is largely confined to work done at the maintenance of way shops at Martinsburg, W. Va. During the recent years quite extensive renewals of bridges have been made on the entire system, old bridges being replaced by ones of heavier rating. Many trestles with timber or I-beam stringers have also been replaced with structures of more permanent character.

As a result of this improvement work, a large number of light steel bridges, both trusses and girder spans, have been removed and also a large amount of miscellaneous structural shapes, principally I-beams, have been



RAILWAY BRIDGE CONVERTED FOR HIGHWAY USE

released. It is the practice to ship all I-beams which are fit for reuse to the Martinsburg shops, where they are stored until some occasion arises for their use. Bridge spans, when removed, are disposed of in accordance with instructions of the engineer of bridges. Practically all girder spans are held for future use unless the steel is badly deteriorated. If truss spans are of such character as to be available for use in highway bridges or on light traffic branch lines they are also held.

These spans are usually shipped to some central point on the division, such as the division storehouse, to be held until needed. A record of size and kind of span is kept in the office of the engineer of bridges and the engineer maintenance of way. Whenever it is necessary to

build new highway bridges or to replace old ones or to renew bridges on lines of a light rating, these lists are checked over and if a span is found which is fairly suitable for the proposed site, it is shipped to the Martinsburg shops for whatever changes and remodeling may be necessary.

Several instances of recent work may be noted in this connection. It has been necessary recently to rebuild two highway bridges in the vicinity of Baltimore. One of these bridges, No. 8 D, is a single span of 66 ft., while the other, No. 5 A, has a main 81-ft. span and two approach spans of 28½ ft. each. In each case, old girder spans were found available for use. The girders were overhauled, several stiffeners and base angles were renewed because the old material was corroded, new lateral bracing was provided, and all necessary shop drilling done preparatory to erection in the field. In the case of the second bridge, it was also necessary to construct two steel bents to carry the main span and one end of each of the approach spans. These bents were made of new material, having latticed posts and bracing of light angles. The total cost of the work on these structures, exclusive of erection, was as follows:

<i>Bridge No. 5-A</i>	
Stock value of old girders.....	\$ 913.00
Other material	532.13
Labor	598.51
Total	\$2,043.64
Approximate total weight	100,000 lb.
Cost of fabrication per pound.....	2.04 cents

<i>Bridge No. 8-D</i>	
Stock value of old girders.....	\$ 806.40
Other material	87.21
Labor	245.17
Total	\$1,138.78
Approximate total weight	85,000 lb.
Cost of fabrication per pound.....	1.34 cents

It will be noted that the cost of steel work on these bridges compares very favorably with current prices of new steel. While the structures as built are perhaps somewhat heavier than would have been the case for newly designed structures, the difference is on the side of safety, and with the present day heavy loads on highways, this factor is an advantage rather than otherwise.

Another instance of work now under way is the overhauling of an old span for the replacement of a light bridge on a branch line. This span is a 103-ft. lattice girder which was removed from the main line several years ago. Work on this structure is now in progress and consists of cutting apart the old bracing system and the fabrication of new cross frames and laterals. The trusses are also being overhauled, corroded angles and plates being renewed and rusted and missing rivets replaced. While the work is not all completed on this bridge, the approximate costs of refabrication will be as follows:

Stock value of old span	\$ 536.00
New material	1,250.00
Labor	500.00
Total	\$2,286.00
Approximate total weight	120,000 lb.
Cost of fabrication per pound.....	1.9 cents

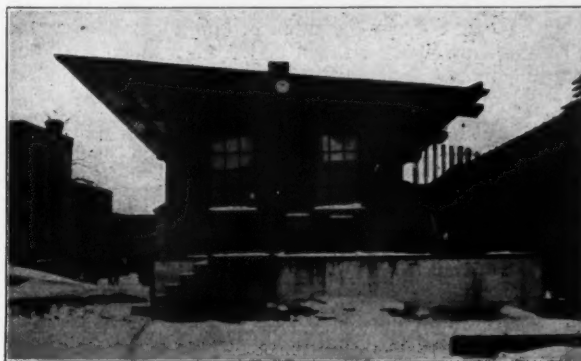
This cost also compares favorably with the cost of a new structure. A new bridge of the same capacity would cost approximately \$4,000, the saving therefore being nearly \$1,800.

Another instance of recent utilization of an old structure is the conversion of an old turntable into an overhead bridge for pedestrian traffic. The old turntable was of 60-ft. span and was both too short and too light

for present equipment. The girders were cut apart from the old cross frames, turned upside down, and a new lateral system was installed. Pipe hand railing was also provided. The cost of this work was as follows:

Stock value of old structure	\$200.00
New material	148.41
Labor	176.66
Total	\$525.07
Approximate total weight.....	33,000 lb.
Cost per pound.....	1.6 cents

While this structure is much heavier than would have been necessary for a new bridge, the total cost of the steel work is small and it is doubtful if it could be bettered with a new and lighter span. Moreover, a most



FREIGHT HOUSE BUILT FROM STRUCTURAL SHAPES

important factor in this case was that of time. This bridge could be gotten out quickly, while if a new span had been purchased its time of delivery under present circumstances would have been problematical. This feature would apply equally to the other structures described above.

Another instance of the reclamation of old material is the furnishing of the steel framing for a small freight house built recently. This material was fabricated very largely from structural shapes taken from an old building which had been torn down some time ago. These shapes, consisting of a number of I-beams, channels and angles, were shipped to Martinsburg, and were fabricated there to conform with the framing of the new freight house. Some additional material for connections and bracing was furnished new. The total cost of this work was:

Stock value of old material.....	\$ 42.15
New material	78.15
Labor	152.44
Total	\$272.74
Approximate total weight	8,000 lb.
Cost per pound	3.4 cents

Again in this case the cost of the steel work fabricated was less than if purchased new and the material was available for quick delivery.

Work of character outlined above has been carried on at the Martinsburg shops for several years and it has been found in nearly all cases that there was a distinct economy in the use of reclaimed material. It has been mentioned above that all I-beams recovered from removed structures has been sent to the shops, and these beams have constituted a very important part of the supply for miscellaneous uses, there being quite a heavy demand for them at all times, either in connection with the fabrication of bridges or other structures, such as scales, or by themselves in small I-beam or concrete-metal bridges.

USES FOR SECOND HAND BRIDGE TIMBERS

By J. C. ELLISON

Roadmaster, St. Louis, Iron Mountain & Southern, Wynne, Ark.

The St. Louis, Iron Mountain & Southern has filled a great many long pile trestles on its southern district during the last ten years, with the result that a large quantity of second-hand trestle material has been released. This includes the ties, stringers, caps, guard rails, etc., and all the hardware commonly used in wooden trestles, in addition to a considerable quantity of material released from the building of structures other than pile trestles. Advantage of the opportunity to reuse this material has been taken to the fullest extent, with the result that material savings have been realized. It is true that it is frequently necessary to saw off considerable decayed portions from the timbers, but it has been found that the sound portions will last from 3 to 10 years according to use and locality. A considerable portion of the old material has been used for the repair of structures like those from which they were removed but a large surplus of material has remained for disposal in other ways.

The old stringers are unquestionably the most valuable members of the old structures and adapt themselves to more uses than any other parts. A very common use for them is as a reinforcement for the stringers in a trestle. One or more second-hand stringers are frequently placed alongside the old stringers to assist them in carrying the load until the structure can be overhauled. Another common use for the poorer pieces is in the repair of back walls for the pit cattle guards or pile bridges. They are also used as mud sills for all kinds of structures.

The largest use for which the second-hand stringers are applied is in the repair of highway bridges across side ditches within the limits of the right of way. Here they are used for flooring, longitudinal sills and mud sills and occasionally for frame bents where these are required. Such structures will last from five to eight years without repairs and with occasional overhauling may be made to last a maximum of 10 years.

Stringers along with other timbers of large size are used for temporary structures or falsework for all kinds of purposes, for the construction of temporary or emergency bridges and tank frames and the supports for icing stations. The less desirable portions can be used for blocking under coal and other outhouses, for cribbing and for repairing timber retaining walls or platform curbs.

With increased attention given to the collection and reclamation of scrap, second-hand stringers are used regularly for the construction of scrap boxes at the section tool houses, roundhouses or other places where scrap is assembled.

In a few cases old stringers have been used for sheet piling, driving them with a regular pile driver. The use of old material of this kind for wales and struts in a cofferdam is quite common. A more unusual use is for the construction of rafts employed in emergency high water conditions to assist the men in getting around structures for the removal of drift and the performance of other tasks. One use for stringers, which involves the other trestle members as well, is found in the construction of temporary drain boxes. As commonly made, the stringers are used for the sides, and ties, sway braces and guard rails are used for the floor or covering, although stringers are also occasionally used for this purpose. These drain boxes will last from four to five years and if overhauled—from six or eight years.

Second-hand ties, guard rails and sway braces have not received as extensive reuse as the larger materials only

because a much smaller number are available in sufficiently good condition. Where possible this material is reused in structures in the same manner as when first used. For instance, sway braces are applied again in places where shorter lengths will serve. They are also used for the flooring of cotton platforms, highway bridges, or any other places where rough floors will serve. They can also be utilized as filler blocks where such are needed. Ties and guard rails have been used with success for hand railings on highway bridges, as it requires very little time and skill to adze the guard rails to proper proportions.

RESAWING WOOD FROM OLD ORE DOCKS

By DELAND CLAPPER

Assistant Engineer, Duluth & Iron Range, Duluth, Minn.

During the past year the Duluth & Iron Range recovered a large quantity of lumber from an old wooden ore dock that was replaced by a new structure. Although the old dock was 17 years old, much of the timber was in good condition. In a structure of this class and age there was a large percentage of material too far gone to be of any value, especially in the walls and floors. On the other hand, the main posts and bracing which were underneath the bin floors were very well preserved.

Much of the timber recovered was used in the crib construction of the new dock, as were also the bolts, drift bolts and boat spikes recovered. Likewise the timber fender along the sides of the concrete foundation was made from old track stringers. Some of the planks and timbers were used in the construction of the forms for the concrete in the new work and for a temporary single track trestle 400 ft. long.

All timber not used in the new dock was cleaned, sorted and piled near a temporary mill to which it is removed for sawing and loading whenever required at any point on the road.

An interesting feature of this work was the recovery of the old bearing and fender piles. The portions of these below water, which ranged from 16 to 50 ft. in length and from 17 to 30 years in age, were sawed into lumber. These piles were pulled with a scow pile puller capable of lifting 85 tons. They were rafted and towed to a nearby landing, where they were pulled out, sawed into logs and later into lumber. This mill was equipped with a 48-in. circular saw with a 40-hp. electric motor, a small planer and a lath machine, and turned out from 10,000 to 15,000 ft. b. m. per day.

There were about 5,000 of these piles, of which about 30 per cent were white pine and 70 per cent Norway pine. Most of the material recovered from them was stored for future use. The quality was very good and it seems to be in a good state of preservation. The following figures give some idea of the sizes and amounts recovered from the old piles:

1 in. x 6 in., 8 in., 10 in. and 12 in. boards	140,000 ft. b. m.
2 in. x 6 in., 8 in., 10 in. and 12 in. plank	280,000 ft. b. m.
3 in. x 6 in., 8 in., 10 in. and 12 in. plank	300,000 ft. b. m.
3 in. x 6 in., 8 in., 10 in. and 12 in. plank	160,000 ft. b. m.
6 in. x 8 in. ties	20,000 ft. b. m.
8 in. x 8 in. ties	40,000 ft. b. m.

Total recovered 940,000 ft. b. m.

In the recovery of the timber from the old dock the following figures are of interest:

Total timber removed	5,500,000 ft. b. m.
Old timber used in cribs	1,240,000 ft. b. m.
Old timber used in temporary work	170,000 ft. b. m.
Old timber used in fenders	100,000 ft. b. m.
Old timber placed to stock	550,000 ft. b. m.
Total material recovered	2,060,000 ft. b. m.
Total material wasted	3,440,000 ft. b. m.

TRAINING MAINTENANCE OF WAY MEN*

A Thorough Discussion of Measures Which Will Lead to the Improvement of the Forces in this Department

BY F. W. THOMAS,

Supervisor of Apprentices, Atchison, Topeka & Santa Fe., Topeka, Kan.

THE largest single item of expense on any modern railroad is the maintenance of its roadway. The higher the standard of the road the greater is the expense. Scanning annual reports of a number of the prominent roads in the country, we find that of \$300,000,000 expense the percentage of the total is as follows, even figures given:

Traffic	6 per cent
Maintenance of bridges and buildings.....	7 per cent
Enginemen	10 per cent
Trainmen	10 per cent
Maintenance of cars	18 per cent
Maintenance of locomotives.....	21 per cent
Maintenance of track	28 per cent

While these percentages vary considerably on various roads, they afford a general average and will serve the purpose in this article.

We have here a department which spends more money than any other, and the qualifications of whose employees, as to education and training, are the lowest of all classes in railroad service. In the early days of the railroads, 70 years ago, we had a higher type of man on the section than at any subsequent time. I believe the Irish race furnished all the trackmen we needed until in the early 90's, but these men have graduated into policemen, politicians and preachers, so that today we find very few Irishmen on the section. While the standard of the roadway has grown higher and higher each year, the general intelligence of the men employed to keep the track in condition has gone rapidly until today it is at its lowest ebb. Probably half of the section men on the railroads of this country today cannot speak the English language. The majority of them can scarcely read and write their native tongue. In the eastern section of our country we find the section hand of Latin, Slav or Balkan extraction; in the South, the negro; in the Northwest, the Asiatic and Greek races and in the Southwest the Mexican. Each of the foreign races is the lowest type of his native land. Even these remain on the section only a sufficient time to enable them to find another job in the town or city.

HOW CAN WE KEEP SECTION MEN?

We have in service on all of the roads in this country, enginemen, conductors, mechanics, clerks, agents, etc., who have grown old in service. I do not mean grown old in service as officers, but they have remained in the ranks, capable and efficient men. How many section men have you on your road who enjoy long-service annual passes? If men will remain a lifetime in other positions, why not on the section? It is not because the work is hard. There are two reasons why men will not stay on the section—compensation and living conditions. They lead lonely lives, the same routine day after day. About the only new faces they see are the new hands employed to take the places of those who quit yester-

day, and, perchance, the lonely hobo. Oftentimes the section is far removed from town or other habitation; there are no schools for the children, no churches, no means for social diversion. You may smile at this, but these men are human, and crave some diversion, "Same as you and I." Their life is one of loneliness and isolation. How can we improve this? It will require some of the so-called "welfare work." We may smile again at welfare work for section men, but other corporations have found that good returns come from such investments.

We will have to provide better living quarters. We have fairly comfortable houses for the foremen, but while the one-room, one-story, windowless building may be comfortable in a way for the men, it offers no privacy of home. It is the wish or desire for privacy which prompts the man living in a city apartment to dwell in ignorance of the family across the hall or on the floor below. It is proverbial that "two families cannot dwell in harmony under the same roof." In place of the present one-story, one-room apartment, build three or four separate one-room houses. Locate them, when possible, in a grove of trees and give each family a certain amount of land on the right-of-way for a garden.

Provide an ample supply of good water for drinking and domestic purposes. This is absolutely necessary for the health of the man and his family. The outdoor work naturally makes it a healthful occupation, for we find little illness other than rheumatism and ailments traceable to impure water. We provide pure water for the passengers on our coaches, and for our enginemen and shop employes; why not for the section men? After finding a good supply, see that it is kept pure—a half-sick man is an expensive employee.

As the majority of the men cannot speak our language, arrange with the wife or daughter of the section foreman to teach these men, an hour each evening, enough English words for them to understand daily orders, or at least to get along. We can't teach them English in the manner we study Latin or French. No effort need be made to teach grammar or the construction of English sentences, but they should be given an opportunity to learn words such as are used or needed on the section. This schooling will make them more efficient, and the foreman will also be benefited, in that he can talk more freely with his men; orders will be more intelligible to the men and time will thus be saved in making himself understood. The teacher should be paid, by the company, from \$10 to \$15 per month. This little schooling will increase the interest of the men in their work and they will become better citizens. The influence of a good teacher upon such students is remarkable. She would be looked upon by them as their patron saint, and her wishes would be their laws. To be able to talk in our tongue would remove a great deal of the isolation of the daily life on the section.

The Y. M. C. A.'s, club houses and reading rooms, supported entirely or in part by the company, have enough daily newspapers and magazines coming to their reading rooms to supply the sections with one or more publications daily. After the papers are read, or when

*The author of this paper has been in charge of the development of the apprentice course in the mechanical department of the Santa Fe to its present high state. He is one of the authorities on the training of apprentices in railway service to-day, and is giving considerable attention to the possibilities of employing similar methods in the maintenance of way and other departments. This article is published in the hope of drawing out suggestions and criticisms from maintenance of way men in order that the subject may be given the attention it deserves and a thoroughly practical plan be developed at an early date.—Editor.

the new ones come in, have the custodian roll up the old ones and send them out systematically and regularly to the sections. This can be done by having the baggage-man on the train throw them off. The weekly or monthly publications can be handled in a like manner. I know a prominent executive of a western road who, when going on the line, saves the papers and magazines that are brought into his car and personally rolls them up and throws them off when passing the section houses. It gives him pleasure to see the scramble for these by the men or their children.

Every month or two furnish the men and their families with a pass to some near-by town, where they can spend the afternoon or evening in recreation—moving picture shows, shopping, etc. Especially is this desirable in the far western states where the country is sparsely settled and the section houses constitute the only buildings. This will give the mother an opportunity of visiting the stores and buying the few things she may need for herself and children. It will be an outing for the family, and will give them real pleasure.

In the far West the section headquarters are far removed from towns and cities, often remote from any other habitation. There is no opportunity of examining, selecting or buying actual necessities of life—groceries, clothing, etc. The company should arrange with some commissary or supply company to furnish these necessary things and to guarantee payment through pay-roll collections. Some officer of the company should personally look into this matter and see that the goods furnished and prices asked are reasonable. The majority of these men are helpless when it comes to any dispute as to quality or price, and there are too many unscrupulous dealers who do not hesitate to impose upon their helpless consumers. The Santa Fe mechanical apprentice system will not permit any collections on pay-roll for anything sold to one of the apprentices until the supervisor of apprentices approves the deduction order. This refers particularly to insurance, sick benefits of fraternal organizations, books, watches, etc. In other words, it is a railroad "blue sky law."

Some provision should be made to furnish a new man and family with the necessities to get him started. Often the man goes to work without a penny of cash, and in a great many cases quits within a few days—not because he does not want to work or dislikes it, but because of absolute want. So he quits to get the little cash due him for the few days he has worked, and thus provide the necessities.

There is no body of men treated with so little consideration as trackmen. They are herded and driven about more like cattle than men. This treatment is endured by the men on account of their ignorance or possibly because of the racial fear of the lowly for those in power. There never was a race or body of men who would not respond to kind treatment when it carries with it the guarantee of sincerity. It has been repeatedly demonstrated that these foreigners will defend, and, if necessary, fight and die for the hand that has befriended them, for the heart that has been kind. This is even true of savages—and even the dog may tear to pieces the hand that punishes him, but will lick the hand that feeds him.

The demands of the writer that the young apprentices should at all times have fair, honest, humane and considerate treatment has revolutionized the treatment of the shopmen by foremen. A few years ago the "turn-over" of mechanics in the Santa Fe shops was $4\frac{1}{2}$ months. Today, as a result of more considerate treatment of the men, the turnover of skilled mechanics in our Topeka shops is 10 years.

COMPENSATION

Whatever the rate of pay, it should be on a service basis—that is, a substantial increase in pay the first six or twelve months, and a slight increase each six months thereafter, until a maximum has been reached. The increase in the pay of especially faithful men should be considered. There is nothing so incentive to service as the knowledge of a raise in pay. The majority of men, especially the kind desired to be held in service, will stay the first six months, expecting to get the increased wage. If you can hold them the first six months the holding will be easier afterwards. We have noted in our apprentice system that, of 100 boys leaving the service during their apprenticeship, 80 per cent leave during the first six months. When you can induce a man to stay six months your chance of holding him the second six months is much greater, and this chance increases as his service lengthens, or until old age or illness incapacitates him. The dollar-a-day section man has passed. Whether we bemoan the fact or not, that day has passed. The higher-wage day is here, and we might as well face it. Now, since we must pay the increased rate, should we not endeavor to so improve his service as to obtain increased efficiency from him? The weeding-out of the least efficient, the rewarding of the most efficient, will improve the body as a whole. Three good clerks in an office are far more valuable than six mediocre ones. Three good section men will do more work than six poor ones. With this class of men, unless the older and better ones are rewarded, they will drop to the level of the slothful one—there will be no incentive to excel.

The reduction in the number of section men in the winter months will give an opportunity of weeding out the least efficient, least promising and least desirable. This will cost some money, care, interest and patience—so will any betterment scheme. We have no standard for measuring the efficiency or capacity of a section man. The general or prevalent impression is that he is the least efficient worker of the whole railroad army. If we can increase his efficiency 5 per cent through this scheme we will be winners, and I know of no place where it can be so profitably spent.

TRAINING FOR MORE RESPONSIBLE WORK

In all classes of work where three or more men are engaged a leader will develop. In any body of men in any vocation, some will crop up here and there who, by sheer physical or mental force, or through natural qualifications, will assume leadership. A man may be elected, he may be appointed, or in an unorganized body or a mob, assume the place. So we, in search of a boss for this body of men, will in many cases take the course of least resistance and appoint this leader "boss." We assume that because he is their leader he must have some power or decided influence over the others, and so we will place him in charge and trust to luck to his making good. Is this the safest or even a sane method? It may be he is the only resort, and possibly on account of this we justify our action. Even if he proves successful it will not justify our placing any man in authority unless we have taken some steps to ascertain his fitness, nor will it excuse us from neglecting to train someone for the place. In the early days of our Government it was soon discovered that we could not depend on the chance method of finding officers for our army, so we established the finest school in the world for the educating and training of army officers—West Point; later on, in like manner, we established the Naval Academy at Annapolis. While we will not be able to establish such a school for section foremen, we can, with a very little outlay, establish a system for the development of such

men. After we have improved the living conditions and established the permanency of the section hand, let us devise some way of picking out the promising ones and prepare them for more responsible work. This "picking" and "preparing" will require the earnest, the moral and the official co-operation of the section foreman, the bridge and building foreman, the roadmaster, the division engineer and the superintendent. Require the foreman to select the best man in his gang and begin training him. Once started, this training will be easy, and, moreover, be helpful. He can begin by giving this man the most difficult and careful work, by sending him alone to a remote part of the section to do such work as required. Let him look after lamps, switches—any work where in time he may learn the habit and value of responsibility. Explain the foreman's duties and responsibilities to him. Show and read to him some of the correspondence that the foreman may have with his superiors. Teach him how each report is made out and what records are kept. If the man continues to improve, and the foreman's confidence in him increases, give his name to the roadmaster, who should "look him over," at a convenient opportunity. If the roadmaster is satisfied with him he should, at the first opportunity, be transferred to the ballasting and rail-relaying gangs for a limited period. With these two gangs he should work his way, but he should be given an opportunity of mastering the work. Possibly a few men might be placed under him, "a sort of straw boss," a tryout in handling men. Then place him with a bridge and building crew. He may not be a carpenter, but there is plenty of less skilled work he can perform to earn his daily wage. The man should be told why he is being changed, why placed in these gangs. Right here is where the value of real co-operation will be necessary. The foremen of these large gangs should be told, personally, of the reason for the presence of this man and each one required to do his best in developing him.

Now, let the roadmaster take him in hand for a week or a month. He may not find any work that the candidate can perform profitably, but he can take the man over his territory, introducing and explaining the methods and materials of other sections, explaining any peculiar condition requiring special efforts or attention, etc. Then, when the superintendent and his staff make their periodical inspection of bridges and buildings, they should take two or three of these men along, at least over a portion of the district. They will not become bridge engineers, but there will be instilled into the minds of these men the necessity of doing things right and keeping them right. It will teach them where to look for defects and will make them observant in other things. They will be better men for the day's association with these officers. The time with the roadmaster and inspection party may not result in immediate gain, but the wages paid him for this time will come back with good, big interest when he is made a foreman. The majority of the section foremen are as faithful and loyal as any class of men in the service. Faithful in all kinds of weather, loyal in any duties, in storm of winter, in floods of spring, in wrecks, in slides—he will be there, responding to the call without a murmur, often anticipating the call. Where we find such loyalty and faithfulness, cannot we afford to give them a better chance to prepare themselves for even more efficient work?

COLLEGE AND HIGH SCHOOL MEN

The second course of material for foremen, and probably the most difficult to recruit, will be the young college man and the high school graduate. To attract this class of "white man," there must be something definite

in sight, something tangible for the future. You can't get this class of young men to go on a section and work as a section hand, at the section-hand wage, with the present section hand's future. This needs no argument, so what can we do or offer in the way of a definite schedule? We can map out a schedule of work, with fixed duties in each step, and fixed compensation. Suppose we employ the young college man, or even a graduate from high school, especially from the country or small-town high school, who can pass a medical examination (those only with a rugged constitution should be engaged), have him fill out regular indenture papers as a maintenance of way apprentice. Let it be distinctly understood in the contract or indenture for what purpose he is employed, what work will be given him, what compensation to be paid during the apprenticeship, and the bonus that will be paid upon completion of the course. Now let us prepare a course for this apprentice as follows:

12 months on regular section work, tamping ties, driving spikes, renewing and tightening bolts, resurfacing, drainage, ditching, replacing fences, highway crossings, cattle guards, etc., and other work common to a regular section crew.

- 1 month with an extra gang renewing ties.
- 2 months with an extra gang relaying rails.
- 2 months with an extra gang ballasting.
- 2 months with the bridge and building department.
- 3 months with the roadmaster.
- 3 months with the division engineer. (He to act as time-keeper in each gang.)

In the extra gangs he should be required to perform the actual work of the regular section man, but in addition to this, he should be tried out for a few days as squad leader, and while in such a capacity he should be closely watched by the foreman in charge, corrected and advised where necessary.

While working with the roadmaster, the latter should take him under his wing, keeping the apprentice constantly with him for the first 30 days. When going over his division he should take the apprentice with him, explaining all features of regular work, especially calling his attention to any new or special work, or any peculiarity of a section requiring more than ordinary attention. The roadmaster should, when opportunity arises, give the apprentice an opportunity of carrying out or supervising some work which would tend to develop his initial talent, impressing upon him the absolute necessity of doing things right. He should single out some section foreman whom he considers the best on the division and emphasize any special feature worthy of imitation.

This class of apprentice should have much to learn from the division engineer. In education and general knowledge, he, being more fortunate than the average foreman, will appreciate the division engineer's work and will obtain more useful knowledge of the work of this office. The engineer can use the apprentice in any capacity other than routine clerical work, though sufficient office work could be given him to familiarize himself with records, estimates, accounts, etc. The division engineer should show him methods to be used in emergencies, such as cribbing up washouts, turnouts, shoo-flies, etc., where to look for defects in stone and concrete work, methods of piling material, etc. Explain to him blueprints of engineering work and all characters, abbreviations, etc., used in making the drawings.

Each foreman and officer in charge of the department under whom the apprentice has worked should write a letter to his immediate superior officer, recounting the work the apprentice has performed, and should comment at length on his ability, industry, leadership, deportment, his general demeanor or action under various conditions

in routine, special and emergency duties, also candidly state if the young man possesses the qualifications for the position as foreman. The apprentice should also be required to read and study some good books on maintenance of way subjects dealing with grading, sub-grading, surfacing, ties, rails, bridges, stone and concrete work. The books should be selected by the company, and arrangements should be made for their purchase by the apprentice. While reading and studying these he should be questioned by the officer, in order to ascertain if he is getting the best out of these books.

The apprentice should be required to write a letter either to the roadmaster or division engineer, every 30 days, reciting the work he has performed, and going into details. He should be taught to criticize existing conditions when he has any remedy to offer, and should be encouraged to suggest anything that will improve existing customs or standards. Such letters should be accepted as a developing feature and should be discussed with him, but not combatted or criticized in such a manner as to discourage originality or defeat the intention of these letters.

The rate of pay for the apprentice should be stated in his indenture. It should be on a monthly basis and should not be less than \$50 per month for the first six months, \$55 for the second, \$57.50 for the third and \$60 for the fourth six months, a bonus of \$25 to be paid him upon completion of the course, which will about pay for the books he will have to purchase.

On a road employing 1,000 section men, some responsible officer should be appointed or designated to supervise

the inauguration of the three schemes. It will be absolutely necessary for its development. The existing division officers have too many varied duties to give it the personal attention which the scheme demands. What is everybody's business is nobody's business. Such an officer, responsible for the success of the venture, will get close enough to the apprentice, the men and the work, to detect anything out of gear or out of harmony. He would also see that it is given a fair trial, and his presence, or at least his appointment, will inspire co-operation. He will standardize the methods used, and as a reviewing officer of methods, men and conditions, he will earn his salary over and over again. The success of the apprenticeship system, in the mechanical department, has been due to two distinct reasons: First, the co-operation and personal interest of the executive and operating officers, and, second, the careful, painstaking and detailed supervision of the apprentices in their selection and instruction. The scheme cannot be successfully nor fairly tried out on one or two sections. It should be made to cover at least a division or grand division. To insure the full co-operation, the scheme should be dignified through official announcement by the highest operating officer.

The maintenance of way apprentice scheme would be an ideal way to develop young civil engineers. Select young college men and put them in as apprentices, and, if they merit it, promote them successively to section foreman, assistant roadmaster, roadmaster, assistant division engineer and division engineer. In each you would have a thoroughly-trained man in the position, educated and trained by your ways, methods and standards.

Perforating Ties Before Treatment

BY O. P. M. GOSS,

Consulting Engineer, West Coast Lumbermen's Association, Seattle, Wash.

THE large volume of lumber used for railroad ties warrants a very careful study of means of decreasing the intensity of the creosote treatment of Douglas fir railway ties by the use of perforations. Accordingly, the West Coast Lumbermen's Association and the Association of Creosoting Companies of the Pacific Coast have devoted considerable study to this subject and have made a large number of experiments, both independently and in co-operation with some of the railroads in an effort to develop the most satisfactory method of preparing and creosoting Douglas fir ties.

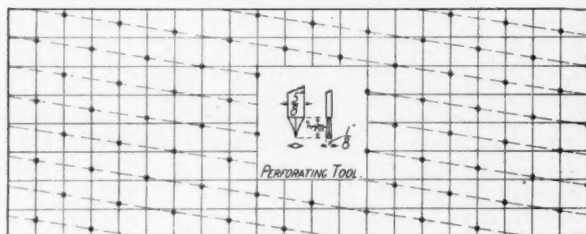


FIG. 1—SPACING OF PERFORATIONS AND SECTION OF PERFORATING TOOL

The mechanical life of a Douglas fir tie untreated is probably at least 15 years under normal railroad traffic. Such ties, however, last only 6 or 7 years in service, due to decay, which eventually entirely destroys the tie. Douglas fir has the required strength to give long life in the roadbed when used as a tie, provided it is possible

to prevent the development of decay. The experiments which have been made have aimed at two principal objects: (1) The prolonging of the natural life of Douglas fir ties by preservative treatment and (2) the applica-



FIG. 2—PUTTING TIES THROUGH THE PERFORATING MACHINE

tion of the preservative treatment effectively without material injury to the wood fibre. If the above points are accomplished it is certain that a greatly increased length of life will result from the use of Douglas fir ties.

In investigating this subject an effort has been made to take advantage of the fact that creosote oil enters wood

along the fibre with much greater ease than in any other direction. The idea was therefore conceived by the writer of perforating the timber to provide a means of controlling the distribution of the creosote oil. This same thought had come to others and B. Kuckuck made some tentative experiments in co-operation with the St. Helens Creosoting Company of Portland, Ore., about 1913. The perforations used were made by means of a drill which bored a small hole about 1-16 in. in diameter.

It has been found that more satisfactory perforations may be made by punching the holes rather than by boring. By making perforations at short intervals it is possible to get a thorough penetration of the oil in the timber equal to the depth of the holes without subjecting it to a severe treatment. A tool which seems to give good results is shaped as shown in Fig. 1. It seems necessary to cut the fibre of the wood in order to get complete distribution of oil with a mild treatment.

A machine was designed and built by the Columbia Creosoting Company, Portland, Ore., for perforating ties. This machine runs at a speed of about 75 ft. per minute, and will perforate ties as rapidly as it is possible for laborers to handle them. The vertical rolls perforate the sides and the horizontal rolls the top and bottom faces. The ties should, of course, be bored for spikes before treatment.

A good spacing for the perforations is shown in Fig. 1. It will be noted that these perforations are so arranged that it is only necessary for the creosote to pass along the grain a distance of $3\frac{1}{2}$ in. and across the grain about 1-16 in. from each perforation, to give complete penetration on all faces of the tie to a depth equal to that of the perforations. The sizes of the perforations are approximately $\frac{1}{8}$ in. across the grain.

The question as to the effect of perforating upon the strength of the wood came up immediately for consideration. For the purpose of securing reliable data on this subject, strength tests were made on ties in both the natural and treated condition.

Thirty-one air-seasoned ties were selected for carrying out these experiments. The ties were of the ordinary grade and were selected so that all tests were made on clear material and in such manner as to eliminate entirely the influence of defects. These ties were all tested

all faces in accordance with the spacing shown in Fig. 1. This 6 ft. section was then placed in the retort and the ties were heated in creosote oil under atmospheric pressure at 170 deg. F. for four hours. Approximately 100 lb. pressure per sq. in. was applied on the oil for three hours

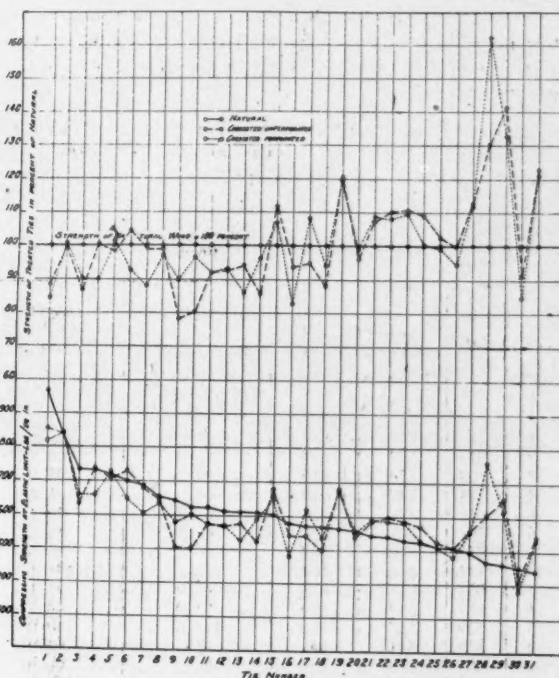


FIG. 3—EFFECT OF TREATMENT ON STRENGTH OF TIMBER

at a temperature of 170 deg. F., after which the oil was drained off and a final vacuum of approximately 24 in. was drawn for one-half hour.

After treatment the ties were tested by the writer. The results of these tests are shown in Table 1 and are presented graphically in Fig. 3. It will be noted that there was no loss in strength, due to the creosote treat-

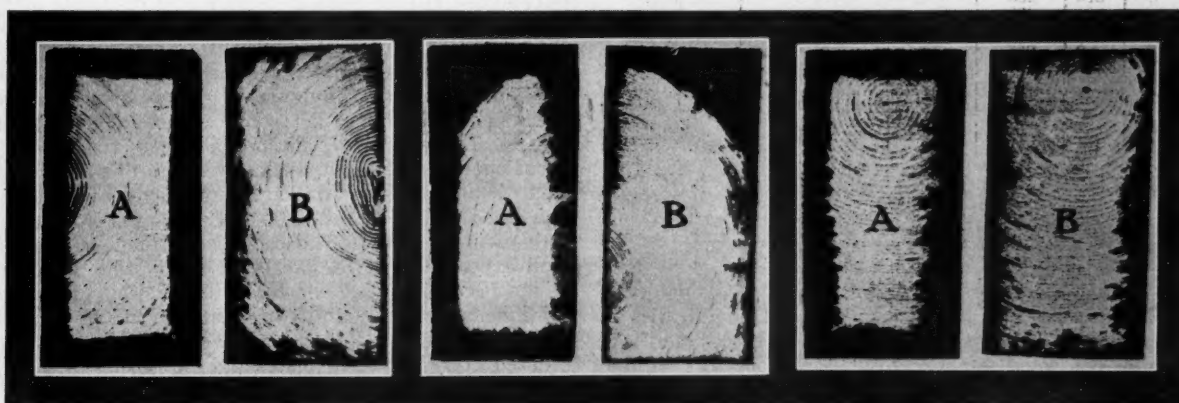


FIG. 4—CROSS SECTIONS OF TIES PERFORATED AND UNPERFORATED, SHOWING RELATIVE PENETRATION OF OIL

in compression perpendicular to the grain. A steel plate 6 in. by 10 in. and 1 in. thick was placed across the face of the tie, covering an area equal to 60 sq. in.

A section 3 ft. long was cut off of one end of each tie, and tested in a natural condition. One-half of the remaining section was perforated to a depth of $\frac{3}{4}$ in. on

ment, as shown by the average results and also that the perforations made in the ties before treatment had no detrimental effect upon the strength. Fig. 4 shows the effectiveness of the perforations in securing uniform distribution of oil. Perforated sections are marked "A" and show a uniform penetration to a depth slightly deeper

than the depth of perforations, while the unperforated sections marked "B" show very slight and ununiform penetration in comparison. These results indicate the possibility of gaining greatly increased efficiency in the use of railway ties when creosoted by the method above indicated. The principal reason for the fact that no loss in strength occurred is that by means of the perforations it is possible to secure an effective penetration and distribution of the oil without the use of a severe heat or pressure treatment.

TABLE 1.—RESULTS OF TESTS IN COMPRESSION PERPENDICULAR TO THE GRAIN ON AIR-SEASONED DOUGLAS FIR TIE SECTIONS

Tie	Compressive Strength at Elastic Limit in Pounds per Square Inch				
No.	Natural	Treated Unperforated	Treated Perforated	Strength of treated unperforated in % of natural. Natural=100%	Strength of treated perforated in % of natural. Natural=100%
1	732	736	657	100.5	89.8
2	611	523	588	85.6	96.3
3	625	576	575	92.2	92.0
4	571	542	619	94.9	108.4
5	611	576	526	94.3	86.1
6	508	507	480	99.8	94.5
7	625	502	603	80.3	96.5
8	441	541	534	122.7	121.1
13	654	647	635	98.9	97.1
14	579	543	479	93.8	82.7
15	529	587	582	111.0	110.0
16	450	411	382	91.3	84.9
41	699	730	647	104.5	92.6
42	524	573	527	109.3	100.6
43	564	680	674	120.6	119.5
44	462	654	614	141.6	132.8
45	544	585	592	107.5	108.8
47	496	559	556	112.7	112.0
48	718	706	726	98.4	101.1
49	645	504	580	78.2	90.0
50	467	609	758	130.4	162.3
51	689	602	606	99.0	88.0
52	604	677	647	112.0	107.1
53	732	634	660	86.6	90.2
54	836	833	842	99.6	100.7
55	558	537	552	96.2	99.0
56	541	597	586	110.4	108.3
57	613	568	570	92.7	93.0
58	567	499	533	88.0	94.0
59	512	525	509	102.5	99.3
60	968	855	817	88.3	84.4
Total	18675	18698	18656		
Avg.	602	603	602	100.2	100.0

A good method for preparing railroad ties of Douglas fir is as follows: Cut ties in the winter and early spring. Perforate and open-pile them for air seasoning, taking advantage of the summer months. The ties may then be in an air-seasoned condition, creosoted in the early fall and winter or at any later date. Handling ties in this way will insure protection against decay and will enable the wood to be creosoted without loss in mechanical strength.

THE TYPICAL RAILWAY TRESSPASSER.—A study of 10,785 cases of casualties to trespassers occurring in 1914 on roads representing 231,000 miles of line shows the typical railway trespasser to be a man between 21 and 30 years of age, of American birth, not a hobo nor intoxicated, an unskilled laborer unemployed at the time, unmarried but living at home near the place of the accident, walking on the track in a country town or village.

THE MATERIAL MARKET

THERE seems to be no end to the possibilities of price advancement in the iron and steel market. During the last month there were appreciable increases in the prices of all track fastenings as well as a great many other iron and steel products used in railway structures. The only redeeming feature, from the standpoint of the railways, is to be found in the fact that the price of scrap which has been stationary for some time took an upward turn during the latter part of the month.

Tie plates after holding to a price of \$55 to \$60 per ton since December, experienced a \$5 advance about the middle of March. Cut track spikes which have been quoted at \$3.40 at Pittsburgh and \$3.50 at Chicago since the first of the year are now \$3.65 in Pittsburgh and \$3.60 in Chicago, this being the base price per keg F. O. B. mills for 9/16-in. stock or larger. Angle bars advanced to 3.25 cents per lb. at Pittsburgh, but remained at 2.75 cents or less in Chicago.

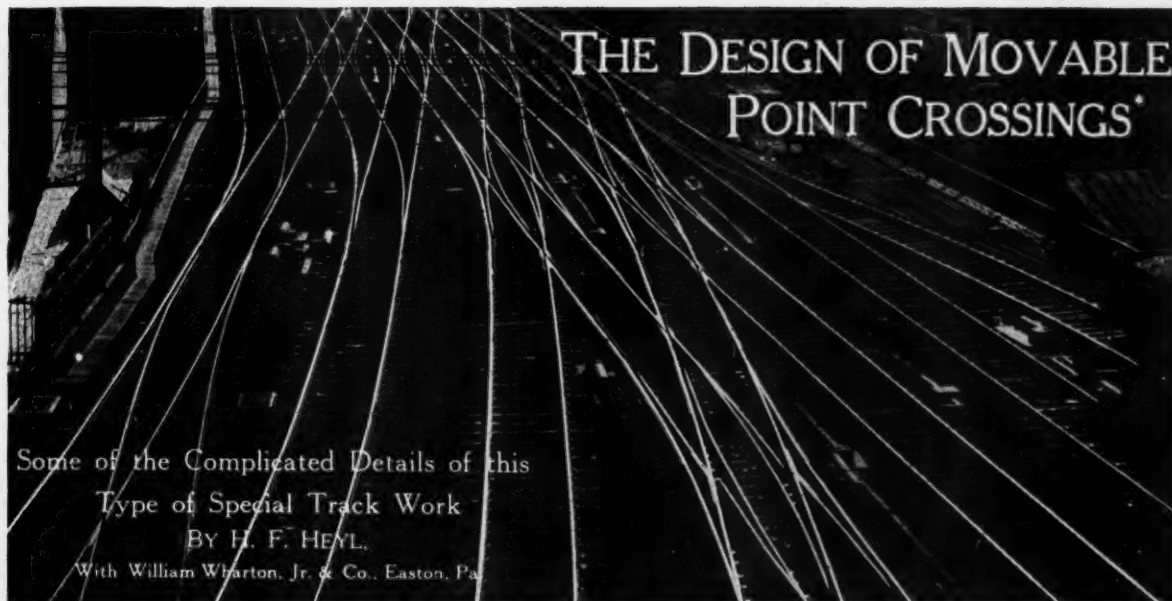
Cast iron pipe also has taken an advance. Four-inch water pipe now sells for \$48.50 per ton and six-inch or larger is \$45.50. It is of interest to compare these quotations with those early in November, 1916, when the corresponding figures were \$35 and \$32, respectively, an increase of approximately 40 per cent in five months. Nails have also advanced, now being quoted at \$3.20 per 100-lb. keg to large purchasers. Boat spikes bring \$3.90 at Pittsburgh, and galvanized barbed wire \$4.05 per 100 lb.

The same story is told in the market for plain structural materials, which serve as the most available index of the cost of fabricated steel. While rather wide ranges of prices are quoted to suit varying delivery stipulations, plates range from 4.69 to 6.5 cents per lb., shapes range from 3.79 to 4.50 cents and bars from 3.54 to 4.00 cents. When it is recalled that in times past bridge shops have fabricated plate girder spans complete ready to erect for less than 2 cents, the present prices are better understood.

Scrap advanced from \$1 to \$3 per ton in the various classes and is moving more rapidly, several railroads now offering considerable quantities for sale. Rail for re-rolling and relaying is also bringing increased prices. Re-rolling rails are selling for \$27 and \$28 at Pittsburgh, \$26 and \$27 at Cleveland, \$29 and \$30 at St. Louis. Relaying rails bring \$33 to \$34 at Pittsburgh, \$34 to \$35 at Chicago, \$37 to \$38 at Cleveland.

In the matter of railroad purchases rails have held a position of secondary importance for some time. The most important order of the month was one of 68,000 tons for the Pennsylvania Railroad, although this is only about one-third of the tonnage for which this road originally inquired. The Alaskan Engineering Commission purchased an additional 10,000 tons of rails, which, together with an order for miscellaneous fastenings, made a total expenditure of \$467,000. A third order was that of the Pere Marquette for 10,000 tons. Rail fastenings continue to sell in quantity. A total of 28,000 tons of tie plates were recorded for one week. The Burlington ordered 5,000 tons of tie plates and the Boston & Albany and the New York, New Haven & Hartford have each contracted for 10,000 tons of spikes.

Portland cement continues to follow the lead of other building materials and is gradually approaching the \$2 mark. With an advance in price this month, quotations on carload lots, not including package, are as follows: Chicago and Pittsburgh, \$1.76; Cleveland and Indianapolis, \$1.89; Minneapolis and St. Paul, \$2.03. The price of lumber continues practically stationary and lumber mills continue to complain of car shortage.



THE DESIGN OF MOVABLE POINT CROSSINGS*

Some of the Complicated Details of this
Type of Special Track Work

BY H. F. HEYL

With William Wharton, Jr. & Co., Easton, Pa.

NEARLY every railroad has its own standard for movable point, single and double slip crossings. Of the various constructions adopted by the various railroads for their own standards no two are alike, although considerable money could be saved if there were common standards. This form of special track work is most complicated, it requires special drawings, and therefore involves considerable engineering expense, while it has to be laid out complete in the shops (Fig. 1) to make sure that everything fits together properly. The saving that would result from the adoption of a common standard whereby the same drawings, templates, jigs, etc., could be used over and over again is evident. The American Railway Engineering Association has gone into the subject to the point of establishing lines and general dimensions for standard slip crossings, but it would be very desirable if further details of appurtenances and connections were also fixed. The character of these structures in which different movable parts must move in unison and come into proper alinement makes it important that the different parts be secured in correct relation to each other. There is a great variety in the means to accomplish this.

MOVABLE POINT CROSSINGS

In crossings of angles lower than a No. 6 (9 deg. 31 min. 37 sec.) or a No. 7 (8 deg. 10 min. 16 sec.) at the very most, rigid middle frogs with the points practically opposite become a cause of derailments. Therefore movable points are used which, being constructed similar to switch points, give a continuous track in one or the other direction. The fixed or stock rail against which the movable points bear is bent to the angle of the crossing and is termed a knuckle rail. A short third or bearing rail is frequently attached to the outside of the knuckle rail to take care of the false flanges of worn wheels. The movable point rails are either made of rolled rail bent and planed to suit and either plain, single or double reinforced similar to the practice with split switches, or they may be made of manganese steel castings. A short easer rail is sometimes attached to the movable point rail

or an extension is provided on a manganese steel point to act like a heel or raising block in the crotch between the movable point and the knuckle rail. Movable point rails should be made as long as possible. There is no set rule to follow and almost every company has a different length.

Knuckle rails are also made of manganese steel castings,—the sections being those recommended by the Manganese Track Society. Fig. 2 shows a movable point



FIG. 1—A MOVABLE POINT CROSSING LAID OUT IN THE SHOP

crossing made out of rolled rail; Fig. 3 shows a movable point crossing with manganese steel knuckle rails and rolled rail points, and Fig. 4 shows a movable point crossing with both knuckle rails and points made of manganese steel. This was first introduced in 1905, and has proven particularly successful under heavy traffic (Fig. 5).

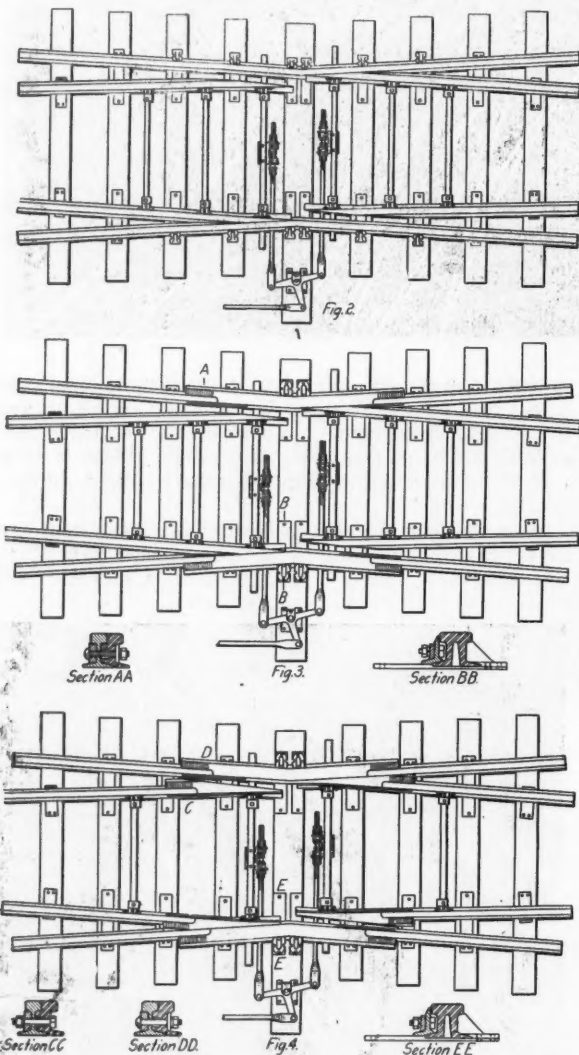
The two pairs of movable points are usually connected by throw rods and bell cranks to move in unison as

*The first article of this series, on "The Design of Special Track Work," appeared in the December issue, page 369; the second article, on "The Correct Design of Split Switches," in the January issue, page 13; the third article, on "Standardizing the Design of Frogs," in the February issue, page 41, and the fourth article, on "The Design of Railroad Crossings," in the March issue, page 91.

shown in the illustrations. Slide plates, sockets, braces and rods are similar to those used on split switches. A bridle plate on the middle tie to hold the knuckle rails in exact relation to each other is a good feature used by some railroads.

SLIP CROSSINGS

Slip crossings, also termed slip switches, are arrangements to connect tracks crossing each other on a long angle so that traffic may be diverted from one to the other. They are single or double, according to whether



the connection is made in one direction only or in both directions. Such arrangements are particularly convenient where economy of space is necessary, such as in terminals and yards. The illustration appearing at the head of this article shows a typical terminal with a series of slip crossings. In this photograph the amount of space saved over turnouts and crossovers can be seen at a glance. The economy of space is accomplished by locating the switches and curves for the connections by curves within the limits of the crossing itself. Additional frogs are also thereby avoided. In a single slip the movement of trains in one direction on each track is trailing to the switch points, in which case the train must back in passing to the other track. While in a double slip a train can go straight ahead from one track to the other when approaching the crossing in either direction.

The angle or number by which a slip crossing is designated is the angle or number of the crossing in which it is located. Thus, for instance, a No. 8 end frog of a slip crossing would indicate a No. 8 slip. Slip crossings range from No. 6 (9 deg. 31 min. 39 sec.) to No. 20. A No. 6 is about the lowest limit, as otherwise the curve connecting the heels of the two switch points becomes too sharp for practical purposes. A No. 6 crossing is also about the lowest limit over which switch engines can operate readily. The No. 8 and No. 10 crossings are most commonly used by the majority of roads, No. 15 and No. 20 crossings being too long for ordinary terminal work and ordinarily used only in main line work. The No. 15 crossing is about 142 ft. long from the $\frac{1}{2}$ in. point of one end frog to the $\frac{1}{2}$ in. point of the other, and the No. 20 about 190 ft., whereas the No. 8 and No. 10 are about 76 ft. and 95 ft. long respectively.

The angles below No. 6 or No. 7 call for movable point construction in the crossings, which should be arranged to be thrown in unison with and to suit the position of the switches. Fig. 6 shows a typical double slip

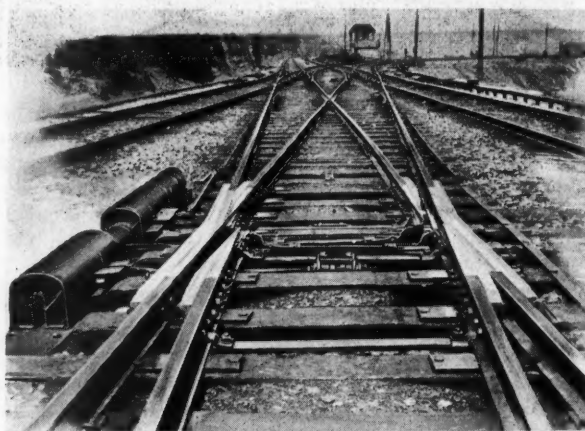


FIG. 5—A CROSSING WITH MANGANESE KNUCKLE RAILS AND POINTS

crossing of the plain bolted type,—Fig. 7 shows a similar one with manganese steel center construction.

The designing engineer should remember in designing a slip crossing to make all parts as nearly as possible to his frog and switch details. First of all the slip crossing should be made to a standard angle so that standard end frogs may be used. The switch points should be as near to the end frogs as possible, while at the same time allowing full unobstructed movement. This should be done so as to give the connecting rails between the switch points as long a radius as possible. Slip switch points should be made to exactly the same details as standard switch points. A standard switch point can in most cases be used, either as it stands or by bending beyond the point of planing.

In double slip crossings the two switches at each end may be placed so that the points come exactly opposite each other, or they may be staggered, as is preferred by some, on account of the details of connections with the throwing mechanisms.

Standard slip switches usually take the following length switch points:

No. 8 and 10.....	15 ft.
No. 15 and 20.....	30 ft. or 33 ft.

The A. R. E. A. recommends the following for its standard slip switches:

No. 8.....	16 ft. 6 in.
No. 11.....	22 ft.
No. 16.....	33 ft.

The movable point rails and knuckle rails are similar to those described in movable point crossings. The plates under the switch points are similar to those used on standard switches. Under the movable points the first plate on either side of the intersections should be a bridge plate, long enough to extend under all eight rails, the

Slips are usually arranged to be operated by interlocking systems, and all movable parts are thrown in proper relation to each other. In rare cases they are hand-operated, two sets of ground levers being then necessary. The ground levers and head rods are connected by means of bell cranks and connecting rods. They are usually

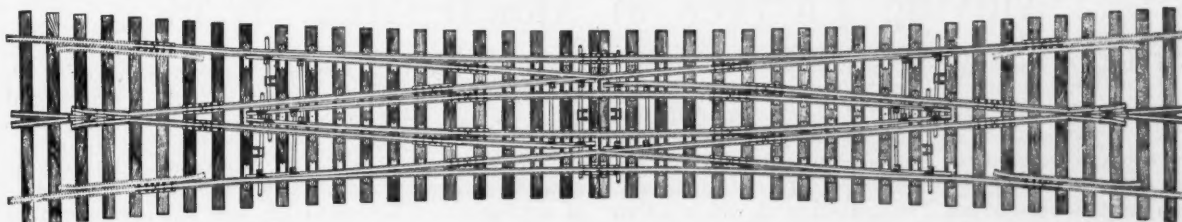


FIG. 6—DOUBLE SLIP CROSSING OF THE PLAIN BOLTED TYPE

movable point rails, knuckle rails, connecting rails and stock rails. This is very important, as it will keep all rails to proper gage, and particularly the knuckle rails, as the latter receive considerable side thrust. There is no set rule to follow as to the length of the other plates under the movable point crossing except that several must be long enough to extend under four rails, as the

placed near each other so that a switchman can operate them without much movement, one of the ground levers taking care of one set of switch points and movable points and the other ground lever taking care of the other set.

The only information required by a manufacturer is the rail section and drilling; the angle or number of the

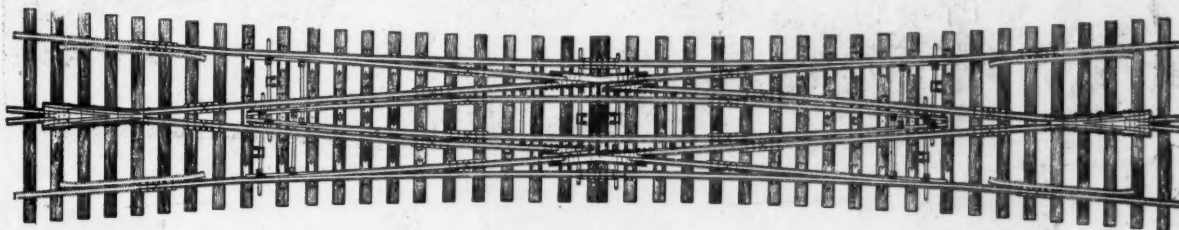


FIG. 7—DOUBLE SLIP CROSSING WITH MANGANESE CENTER CONSTRUCTION

distance between the knuckle rail and the movable point rail is too small to allow short plates. Bridge plates should also be placed under the extreme switch points.

The throw rods may be separate, but in many cases they are connected so as to serve for both switches on each end of the slip. Under the movable points the rod on either side of the intersection must be long enough to

crossing, and the style of construction. If the crossing is curved it is better to furnish a sketch showing the angles and the direction of curve. Careful and exact installation of slip crossings is very important to the proper working and life of the structure. It is advisable to use good switch timbers on account of the multiplicity of parts, and care must be taken in the placing of the ties so that all the connections of the movable parts can move freely.

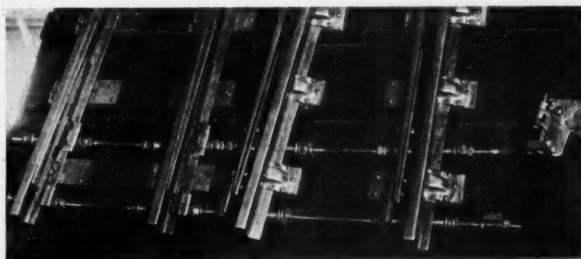
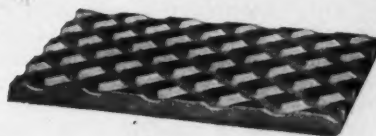


FIG. 8—ONE TYPE OF CONNECTING RODS FOR SLIP SWITCHES

extend somewhat beyond the stock rails to permit attaching them to a connecting rod or interlocking machine. On account of placing all parts in alignment, adjustable features on the rod are desirable. In recent years several types of rods have come on the market which are particularly adapted for slip switches. One of them is shown in Fig. 8. It combines the adjustable features and insulation in a simple manner. Connections can be made directly with any interlocking machine. Heel joint-blocks made either of cast steel or forged steel should be placed at the heel of the switches.

A NEW SAFETY TREAD

A NEW type of safety tread has been put on the market which consists of a skeleton metal frame, the upper surface of which presents a series of raised diamond-shaped openings in which the base or body of the tread is exposed, each diamond-shaped face being surrounded by a frame of metal on edge. The body of the tread contains the abrasive throughout its entire thick-



THE NEW SAFETY TREAD

ness and thus retains its function as a safety tread until it is entirely worn out. The upper surface of the metal frame between the tread bearings is depressed, forming grooves which receive any foreign matter, matches, snow, ice, etc., thus keeping the tread surfaces in condition for use. These treads can be applied to all types of stairways whether wood, stone, concrete or steel, and when

ordered for concrete are shipped with anchors ready to be put in place. This tread is known as the Mason Black Diamond safety tread and is put on the market by the American Mason Safety Tread Company, Lowell, Mass.

The treads were subjected to a year's service test on the stairs at the main entrance of the Brooklyn bridge, New York City, and showed very little wear at the end of that time.

Moving Pictures in Maintenance Work

THE Pennsylvania Railroad is making extensive use of motion pictures for the purpose of impressing on its employees, particularly in the shop and track service, and the members of their families, the importance of safety first principles in railroad work and the proper and improper methods of performing the various duties of employees. The method used, which is that adopted by a number of railroads, is to prepare scenarios of complete stories with "human interest" and dramatic

displayed before large meetings of employees at Altoona, Harrisburg, Philadelphia and in the rooms of the railroad Y. M. C. A. of the Washington Terminal Company at Washington.

"The Americanization of Tony" portrays the story of a young Italian who is attracted to America by hearing of the success of his friend Joe, who has been employed for some time on a section gang on the Pennsylvania, and who has a sister Maria in whom Tony is interested.



SHOWING DANGER OF MASHING FINGER WHEN UNLOADING MATERIAL

IMPROPER FLAGGING

USE OF THE TRACK GAGE

TONY HIT BY A TRAIN WHILE FLAGGING IMPROPERLY

IMPROPER USE OF THE SHOVEL

FLAG PROTECTION FOR A TRACK GANG

effect, portraying the life and work of railroad employees in such a way as to illustrate safe and unsafe practices and the most efficient methods and to drive home the lessons intended to be conveyed, while at the same time illustrating the efforts of the management to look after the welfare of the employees. The pictures have been taken by the test department of the Pennsylvania Railroad and all the parts in the various scenes are taken by employees of the railroad or by members of their families where the characters are women or children. The pictures are presented at various gatherings of the employees, at various points on the railroad system, frequently in the evening so that members of their families may attend, and they have been very largely attended. One picture play, entitled "Shorty, the Car Inspector," has been used for nearly a year, and another entitled "Smoke Prevention" since last August among the employees in the mechanical department. Recently a new film entitled "The Americanization of Tony," which is designed especially to interest the maintenance of way employees, has been

Through Joe's efforts Tony is given a job in a section gang and his experiences are used to illustrate the importance of safety-first principles and the opportunities afforded by the railroad to its employees. A synopsis of the story shown on the film is as follows:

Tony is employed in the vineyards of Italy, working for a mere pittance. His thoughts revert to his friends, Joe and Maria, who have been in America for some years. In America Joe and Maria are shown cosily situated in their own home and have a comfortable bank account. Joe leaves for work with his gang and as a part of the daily work of the section gang scenes are shown: of the proper and improper use of the pony truck for carting material, the damage done by sticking picks and bars in telegraph poles, flag protection for gangs working on the tracks, the use of the track jack, tie tongs and lining bar, and finally the return of the track gang to the tool house, where is shown the proper cleaning and care of tools.

As Joe leaves for home at the end of the day the fore-

marf asks him if he knows of any new men he can secure to work in the section gang. When Joe arrives home he find Maria reading a letter from Tony in Italy, stating that, had he the funds, he would come to America. Maria persuades Joe to send Tony the necessary money, and he is seen leaving Italy on the bow of the Italian liner, Giuseppe Verdi. In due time he reaches America and is shown complying with the necessary government regulations at Ellis Island and at quarantine.

On arriving at Joe's home, Tony is met by Joe and Maria and on the following day he is introduced to the foreman as a new man for the section gang. Tony is then taken in hand by the section foreman and is instructed in the proper manner of using the adz and other cutting tools, the use of goggles, carrying rails, unloading material from cars, the use of the tamping pick and the pneumatic tamper, the track gage, the ballast fork and in spiking. The necessity of clearing all tracks at the approach of a train is explained to him, and he is given a copy of the rules governing the employees working on and about the tracks.

Tony is then shown as developing careless habits, such as sitting under cars, riding between cars, and riding on flat cars with his legs hanging over the side. He is told that such carelessness is sufficient cause for dismissal from the service and is warned to be more careful. As a result of dissipation Tony is struck by a train while sitting on the track at a time when he was supposed to be giving protection, by flagging, to a section gang farther up the track.

This is the turning point in Tony's career and at the end of six weeks he has sufficiently recovered to be able to walk about the grounds surrounding Joe's home. While on one of these walks with Maria, he asks her to marry him. Maria refuses on account of Tony's carelessness, and because Joe will not consent to their marriage as long as Tony's habits are such as would make her future protection uncertain.

Because of his love for Maria, Tony starts a savings account and returns to work in the section gang as a track-walker. The foreman sees the change in him and tells Joe he is becoming one of the most efficient men in the gang, and that he has been commended for his prompt action in reporting a hanging brake rigging. Tony enters the railroad school for foreigners with a view to obtaining the necessary education to become a naturalized citizen. The picture ends with Joe giving his consent to the marriage of Tony and Maria, and they are shown entering the future together as true American citizens.

The titles interspersed with the pictures fully explain the points intended to be emphasized and constitute a series of lessons on the best methods of performing various classes of work. The interest taken by the management in the welfare of the employees is shown in the care taken by the foreman to instruct Tony in the proper methods; Joe's bank account and his visits to the bank to make deposits explain the company's saving fund for employees, and the pictures of the company's school for foreigners show what the company is doing to help its employees to obtain an education.

The Use of Cribbing for Retaining Walls

BY C. P. RICHARDSON,

Assistant Engineer, Chicago, Rock Island & Pacific, Chicago, Ill.

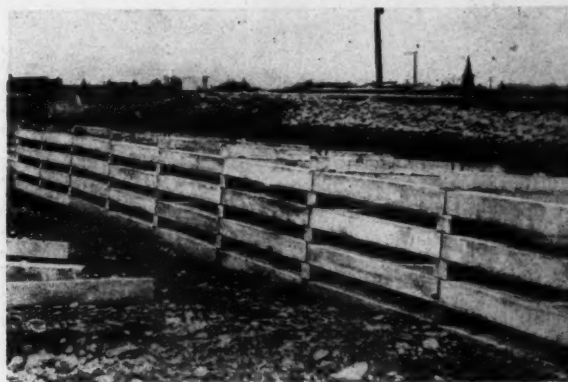
DURING the construction period of grade separation work on the Chicago, Rock Island & Pacific, between Seventy-fifth and Eighty-third streets, Chicago, approximately 33,000 sq. ft. of cribbing surface, varying from 3 to 16 ft. in height, was used as temporary supports for embankments. The project in question required a separation of grades between the Rock Island and the Chicago & Western Indiana at Seventy-ninth street, and on account of operating conditions and construction costs it was deemed most economical for the former to take the upper level. Because of the great elevation required, the construction work necessitated the building of walls and embankments, ranging from 20 to 40 ft. above the natural ground level. The line passes through a residential district with an available width of right-of-way of 100 ft., and as it was practically impossible to obtain any additional right-of-way for construction purposes, the traffic, which was handled on three main tracks, occupying the central portion of the right-of-way, was detoured to the west in order that work might proceed.

CRIBBING MADE OF TIES

As the remaining property was insufficient to care for the embankment slopes for the future tracks on the elevated grade, it was necessary to devise some arrangement to support the embankment temporarily, without endangering traffic on the operating tracks below. A thorough study of the problem resulted in the adoption of timber cribbing for the support of sufficient embankment for a two-track roadway and the construction of one line of trestle on the location of the third track. The cribbing was varied in height and line, owing to the fact

that in some cases additional property could be obtained for the temporary tracks.

The cribbing was constructed of ties which had been removed from tracks and were valueless for further serv-



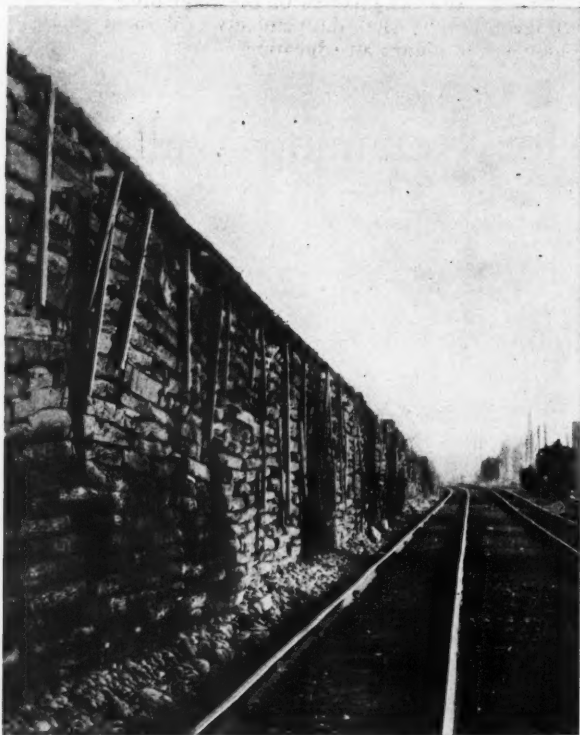
LOW CRIBBING OF CONCRETE TIES

ice. As a general rule, front and rear lines of stretchers were used, and headers placed every tie length, with broken joints, all ties being spiked together with 10 or 12-in. boat spikes. The cribbing was constructed to heights varying from 3 ft. to 16 ft. 6 in., as conditions required, and four strands of No. 8 wire were used to tie the face of the cribbing to the adjacent timber trestle where the height exceeded 10 ft. Cribbing less than 5 ft. in height was constructed with the rear line of

stretchers omitted. In many cases two or three rows of ties were spiked on the top of the cribbing and wired to the trestle for support, to prevent stones or boulders from rolling over the top of the cribbing onto the operating tracks.

The construction of cribbing was started in January, 1914, and continued as filling progressed, thus supporting the embankment pressure until traffic was placed on the elevated tracks in November, 1914. After that it carried the additional pressure of the superimposed train load on two tracks until November, 1915, when construction work was completed on the west side of the right-of-way. No failures were noted during the entire period that could be attributed to the pressure of the embankment slopes, or to the traffic, until excavation work started on the west side. At this time a heavy clay dumped on the top of the slope behind the cribbing caused a heavy surcharge in excess of the $1\frac{1}{2}$ to 1 slope previously used. This additional load caused a maximum movement of 2 ft. in the distance of 50 ft. effected. The maximum movement occurred at about two-thirds of the height, with the top moving out about one-third of the maximum, the bottom remaining fixed.

From the results obtained it would appear that timber cribbing, well constructed, as above described, is economical and safe for supporting embankments temporarily during construction. The slope behind the crib-



A WALL OF OLD TIMBER CRIBBING

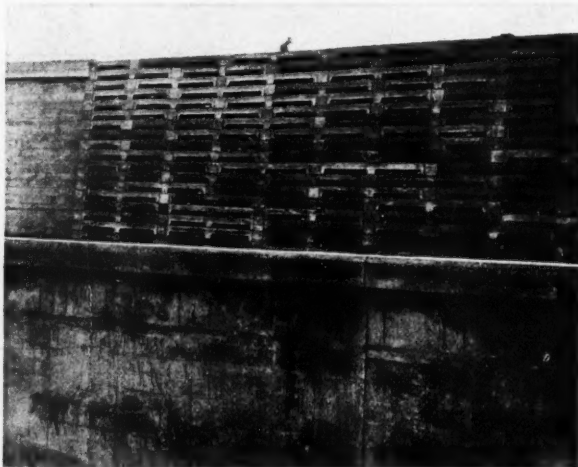
bing should not exceed the angle of natural repose of the soil, and for safety, the height of the cribbing should not exceed 10 ft., unless it can be by wire or otherwise supported from an adjoining wall or trestle.

CONCRETE CRIBBING

The satisfactory results obtained in the use of this cribbing, made out of old and useless timber, lead to the testing of the value of this style of cribbing constructed of concrete. Two types of concrete cribbing were developed and used as a substitute for a retaining wall in con-

nection with a two-level embankment, as shown in two of the photographs.

The members of the dowel type cribbing are similar in design to the ordinary wood cross tie. The headers were made 8 ft. in length, with a 6-in. square cross-sectional area, expanded to 6 by 8 in. at a distance of 8 in. from each end. The stretchers were made 8 ft. in length, with a uniform 8-in. square cross-section. In placing the members, the stretchers were bonded to the headers with $\frac{5}{8}$ -in. rods, dropped through $\frac{3}{4}$ -in. holes left in



CONCRETE CRIBBING ABOVE CONCRETE RETAINING WALL

both ends of the stretchers and in the front end of the headers.

Cribbing members with interlocking ends were constructed with 5-in. square section. The ends of the headers were made with two projections $2\frac{1}{2}$ in. long at each end in plan, and with a 4-in. projection 6 in. thick at each end in elevation, so as to form an end area of 9 by 10 in. The stretchers were made with the ends notched $2\frac{1}{2}$ in. to match the headers, and a 4-in. projection in elevation to form an end area of 5 by 10 in. An additional 4-in. projection, 6 in. wide, was placed in the center of each stretcher to give support and to allow the stretchers to be laid with broken joints, thus forming a more compact wall. All ties were reinforced with $\frac{1}{4}$ -in. square bars.

Only a small amount of the dowel type cribbing was used, as the weight of the pieces was such as to make it uneconomical to handle them by hand, and it is not always practical to furnish a derrick for the small pieces of work for which this cribbing is adaptable. The members of the second type, with interlocking ends and smaller cross-sectional area, are much lighter and can be handled easily by two men.

A photograph shows this type of cribbing wall built with a front batter of one inch to the foot, to heights varying from 10 to $13\frac{1}{2}$ ft.. This cribbing was placed in the latter part of 1915 on a new embankment 20 ft. high, supported by a retaining wall 19 ft. in advance. After a year's service no signs of failure have been noted. The embankment was thoroughly settled with water before the cribbing wall was placed, and only a slight subsequent settlement has occurred.

Experience has shown that this type of construction forms a very compact wall, at a cost less than one-half that of the usual retaining wall. On account of its elastic properties, this type of construction can be used in many locations where, on account of the poor foundations, the cost of retaining walls would be prohibitive.

GENERAL NEWS DEPARTMENT

THE NASHVILLE, CHATTANOOGA & ST. LOUIS has offered its track men the use of spare tracts on the right-of-way for gardens.

THE CHESAPEAKE & OHIO, since its inauguration of the safety first work on January 1, 1913, has, through its various safety committees, acted upon 2,500, or 94 per cent of the 2,705 suggestions received from its employees.

THE CHICAGO, ROCK ISLAND & PACIFIC has paid over \$405,677 in pensions between January 1, 1910, and March 1, 1917. The total number of employees pensioned during that time was 344, of whom 108 have since died.

THE NORTHERN END of the New York Connecting Railway, including the Hell Gate bridge, was placed in service on March 9. This line provides a physical connection between the New Haven and the Pennsylvania systems and enables trains to be operated between New England and western and southern points through New York.

THE NEWLANDS COMMITTEE resumed its investigation of railway regulation at Washington, on Monday, March 19, after having suspended hearings on December 9. A number of railway men are appearing before this committee to lay before it their views regarding the solution of the problem of railway regulation.

L. M. HARRIS, manager of the press bureau of the St. Louis-San Francisco, recently prepared a card containing a few salient railroad statistics, which he has been sending to school children in rural communities to give them an idea of the magnitude of the railroad business. He intends to send other cards later with the hope that he may gradually impress upon them some of the basic principles of the transportation problem.

THE DELAWARE & HUDSON plans to plant 1,250,000 trees this year along its line in the vicinity of Loon Lake, in northern New York. This company has a nursery at Bluff Point, on Lake Champlain, where about 5,000,000 young trees are growing. The Delaware & Hudson controls 106,000 acres of land in the Adirondack mountains west of Plattsburg, N. Y. The company has already planted millions of trees on this tract.

THE CALIFORNIA STATE RAILROAD COMMISSION is now making an investigation of each of the 10,000 grade crossings of the state and is suggesting improvements which are considered necessary to promote safety. Up to January 1, 1917, approximately 2,000 crossings had been reported on and of 1,100 recommendations made at that date, 10 per cent of the improvements suggested had been installed and 70 per cent were in the process of being carried out.

THE MICHIGAN SUPREME COURT holds that, although the protection of the Michigan Workmen's Compensation Act extends to a reasonable time and space for the employee by the day to leave his place of work, it does not protect a workmen from injury which did not "arise out of and in the course of his employment," nor entitle him to compensation under the act, as in the case of a claimant under this law, employed in railroad track construction, who was struck by one of the railroad's trains after working hours.

THE SOUTHERN PACIFIC, at the conclusion of the present fiscal year, will award a gold-plated medal bearing its safety medallion, and properly engraved with the employee's name, to the six employees on each division and in each general shop who have displayed the most interest in safety work. The competitors will be graded on the basis of the number, the character and the importance of suggestions offered by them to the safety department. Last year the prize winners were each given a watch fob with a rolled gold charm.

THE RAILWAYS ENTERING WASHINGTON brought about 90,000 people into that city through the Union station on March 2 to 5, inclusive, on the occasion of the inauguration of the President. Approximately 1,200 trains were handled in these four days, including 275 extra trains. The Union Station Company em-

ployed 566 extra station men to handle the crowds. The Baltimore & Ohio held 130 engine crews for service on the Baltimore division, while the Pennsylvania had 50 extra locomotives and train crews at Philadelphia and Baltimore.

A STRIKE OF 1,000 maintenance of way employees of the Chicago & Alton, scheduled to go into effect on March 28, failed to materialize. Announcement of the strike order had been made by R. E. Clodfelter, grand organizer of the union, who stated the demands of the men as an increase of \$10 a month for foremen and assistant foremen, a 12½ per cent increase for employees in bridge and water service and an advance from 19 to 22½ cents an hour for track laborers.

THE SUPREME COURT OF APPEALS OF VIRGINIA holds that a railroad which, to protect its line, builds a high embankment several feet from the shore line at low water mark, and narrows the channel of the river, is not liable therefore to a riparian owner whose land is damaged by the flood of an unusual and extraordinary freshet. A railroad is within its right in changing the location of its tracks from one part of its right of way to another to escape the danger incident to a very sharp curve, and in constructing an embankment sufficiently high to protect its roadbed and other property from injury by accidental and extraordinary floods.

THE CHICAGO GREAT WESTERN has provided life insurance for those section foremen and shop employees who have been in the service of the company at least one year. The policies are equal in amount to one year's pay with a minimum payment of \$500 and a maximum of \$2,000. There will be no expense of any kind to the insured, nor will any physical examination be required. When employees leave the road, the policies automatically become void. Nearly 850 men are affected by the plan, which became operative on March 1. The scheme is an experiment, and if it proves satisfactory will be extended to other classes of employees.

THE CENTRAL OF GEORGIA furnishes its employees an average of 3,600 copying pencils, and 3,312 lead pencils each month, at an average cost of \$106.15. The road has an average of 11,300 employees on its payroll each month, of whom 6,000 are furnished pencils. The lead pencils cost 0.94 cents, and the copying pencils 2.09 cents each. The road has to haul a ton of freight more than a mile to earn enough to pay for one lead pencil and nearly three miles to pay for a copying pencil. If each of the 6,000 employees using the pencils uses one more inch off each pencil before throwing it away, nearly 6,000 inches of pencil would be saved each week.

THE CHESAPEAKE & OHIO EMPLOYEES' MAGAZINE for March includes in its roll of honor of employees who have performed services drawing special commendation, the names of P. J. Butler, H. L. Seay and B. H. Miller, section foremen, who discovered brake beams dragging and resorted to prompt measures to stop the trains before accidents resulted. Special mention was also made of J. H. Woody, track walker, who discovered a drop door down under a coal car and notified the crew as the caboose passed him so that the train could be stopped. John Ball, cook, is also mentioned because of his discovery of a broken rail in the main track and the prompt flagging of a train.

DURING THE MOVEMENT of troops to and from the Mexican border the special committee on co-operation with military authorities of the American Railway Association directed the operation of trains under the general direction of the quartermaster-general of the United States army. In addition various military committees of the railroads determined the routing of troops to avoid congestion at any gateways, or on any of the lines, and to keep the traffic spread. These committees also fixed rates and adjusted accounts between railroads. They have been in existence since the spring of 1915, and with the experience of the movement to and from the Texas frontier, are now in a position to run military trains to any part of the country with the least possible congestion or interference with other traffic.

PERSONAL MENTION

GENERAL

C. T. SPONSEL, roadmaster of the Northern Pacific at Garrison, Mont., has been appointed trainmaster, with headquarters at Forsyth, Mont., succeeding W. C. Sloan, promoted.

BEN L. ALLEN, chief engineer of the Colorado, Kansas & Oklahoma, at Scott City, Kan., has been appointed superintendent and treasurer, succeeding F. S. Yantis, assigned to other duties.

A. T. MERCIER, division engineer of the Southern Pacific at Los Angeles, Cal., has been appointed assistant superintendent, with headquarters at Dunsmuir, Cal., succeeding G. V. Gillette, assigned to other duties.

C. H. BUFORD, engineer of track elevation, Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has been appointed trainmaster on the Sioux City and Dakota division, with headquarters at Sioux City, Iowa, effective March 29.

C. H. MITCHELL, track supervisor of the Louisville & Nashville, with headquarters at Butler, Ky., has been appointed general cross-tie agent, with headquarters at Beattyville, Ky., effective March 4, succeeding C. W. Moorman, resigned.

A. J. SMITH, roadmaster of the Lake Erie & Western at Tipton, Ind., has been appointed division superintendent at Muncie, Ind., succeeding J. W. O'Brien, transferred. In addition to his new duties as superintendent he will retain jurisdiction over the maintenance of track and roadway, reporting direct to the chief engineer on these matters.

ELISHA LEE, assistant general manager of the Pennsylvania Railroad, has been appointed general manager, succeeding S. C. Long, deceased. Mr. Lee was born in Chicago, Ill., on September 24, 1870, and graduated from Massachusetts Institute of Technology in 1892. He entered railway service as a rodman in the office of the division engineer of the Tyrone division of the Pennsylvania in November of that year. He was appointed assistant supervisor in April, 1899, supervisor in April, 1901, assistant engineer maintenance of way in August, 1903, principal assistant engineer on the Philadelphia, Baltimore & Washington in April, 1907, superintendent of the New York, Philadelphia & Norfolk on March 24, 1909, and assistant general manager of the Pennsylvania Lines east of Pittsburgh and Erie, on March 3, 1911.

R. N. BEGIE, chief engineer of the Baltimore & Ohio system, has been appointed general manager of the eastern lines, effective April 1. Mr. Begie is a graduate of the engineering college at Harvard University. After serving several years in Central and South America, he entered the employ of the Baltimore & Ohio as an assistant engineer on August 1, 1902, being promoted to division engineer at Philadelphia in June, 1908. He was made assistant to A. W. Thompson, chief engineer, on May 1, 1910, and accompanied him as his assistant when he was appointed general manager and later third vice-president. In December, 1912, Mr. Begie was appointed assistant general superintendent at Baltimore, and in July of the following year general superintendent of the Baltimore & Ohio Southwestern, which position he held until his appointment as chief engineer in June, 1916.

CHARLES W. BROWN, who has been appointed superintendent of the Lehigh & New England, with headquarters at South Bethlehem, Pa., was born at Fort Gaines, Ga., on January 10, 1880, and entered railway work in the engineering department of the Central of Georgia, in September, 1898. From 1900 to 1904, he was transitman and resident engineer of the Baltimore & Ohio, leaving on the latter date to become assistant engineer and engineer of roadway on the Atlantic Coast Line. From 1908 to 1909 he was locating engineer on the Central of Georgia and then for two years was superintendent of the Hall Parker Contracting Company. On August 15, 1911, he was appointed engineer maintenance of way of the Lehigh & New England, and in December, 1913, was promoted to assistant superintendent, which position he held at the time of his present appointment.

ENGINEERING

G. H. COOK has been appointed division engineer of the Northern division of the Kansas City Southern, with headquarters at Pittsburg, Kan., succeeding J. M. Wier, promoted.

WILLIAM WALKER has been appointed acting division engineer of the Grand Trunk, eastern lines, with office at Montreal, Que., succeeding F. L. C. Bond, enlisted for overseas service.

F. K. BENNET, valuation engineer of the Minneapolis & St. Louis, at Minneapolis, Minn., has been appointed principal assistant engineer, succeeding J. H. Reinholdt, who has entered the service of another company.

J. C. RESCH, superintendent of the Fort Worth division of the International & Great Northern at Mart, Tex., has been appointed chief engineer with headquarters at Houston, Tex., succeeding O. H. Crittenden, deceased.

W. TRAPNELL, district engineer maintenance of way of the Baltimore & Ohio, with headquarters at Wheeling, W. Va., has been appointed chief engineer and superintendent of the Coal & Coke Railway, with office at Elkins, W. Va.

C. F. URBUT, assistant engineer, Chicago, Milwaukee & St. Paul, has been appointed engineer of track elevation with headquarters at Chicago, effective March 29, vice C. H. Buford, whose transfer to the operating department is announced elsewhere.

W. M. JAECKEL, division engineer of the Southern Pacific at Bakersfield, Cal., has been transferred to Los Angeles, succeeding A. T. Mercier, promoted. J. P. Edwards has been appointed division engineer at Bakersfield, succeeding W. M. Jaeckel.

NOAH JOHNSON, assistant chief engineer of the Wabash Railway, with headquarters at St. Louis, has been appointed engineer maintenance of way of the Peru division, with headquarters at Peru, Ind., succeeding R. S. Charles, resigned to engage in other business.

W. C. CURD, drainage engineer in charge of water supply, river protection, flood protection and drainage on the Missouri Pacific Iron Mountain system, has resigned to become connected with the Layne & Bowler Company, water supply engineers and manufacturers of pumps.

E. P. MENEZ, district engineer of the New York Central at Albany, N. Y., has been appointed assistant valuation engineer, with headquarters in New York City. M. S. Thompson, assistant district engineer at Albany, has been made district engineer at Albany, succeeding Mr. Menez.

HARRY A. LANE, assistant to the chief engineer of the Baltimore & Ohio at Baltimore, Md., has been appointed chief engineer, effective April 1. Mr. Lane began railway work in 1895 as a rodman in the engineer corps of the New York, New Haven & Hartford, and in 1901 he was made assistant engineer in charge of the northern half of the grade crossing elimination work at Fall River, Mass. In December, 1902, he entered the employ of the Baltimore & Ohio in the office of the assistant engineer of surveys at Baltimore, Md., and in 1910 he was promoted to assistant engineer of surveys. In September, 1916, he was appointed assistant to the chief engineer, which position he held until his recent appointment.

M. H. DOUGHTY has been appointed assistant to the chief engineer of the Delaware, Lackawanna & Western, with office at Hoboken, N. J., in charge of valuation, the general drafting office and special duties as assigned. S. L. Rice, office engineer, has resigned and that position has been abolished. Mr. Doughty entered the service of the Lackawanna in 1902 as a rodman in the division engineer's office at Scranton, Pa. In 1903 he was promoted to assistant engineer, and in 1909 was transferred to Hoboken as assistant engineer. From 1910 to 1913 he was general manager of the Moore Timber Company at Bay Harbor, Fla., and in 1914 he returned to Hoboken as assistant engineer in charge of valuation and other duties as assigned, which position he held until the time of his recent appointment.

H. H. HARSH, division engineer of the Baltimore & Ohio, at Garrett, Ind., has been transferred to Pittsburgh, succeeding C. C. Cook, promoted, and J. Tordella, division engineer at

Newark, Ohio, has been transferred to Garrett, Ind. C. R. Diemar, assistant engineer in the office of the district engineer, maintenance of way, of the Cincinnati, Hamilton & Dayton, with headquarters at Cincinnati, Ohio, has been appointed division engineer of the Newark division of the Baltimore & Ohio, with headquarters at Newark, Ohio, succeeding J. Tordello, transferred. John Mayer, assistant division engineer of the Baltimore & Ohio, at Chillicothe, Ohio, has been transferred to the office of the engineer maintenance of way of the Cincinnati, Hamilton & Dayton, succeeding Mr. Diemar.

W. C. KEGLER, engineer maintenance of way of the St. Louis division of the Cleveland, Cincinnati, Chicago & St. Louis at Mattoon, Ill., has been appointed engineer maintenance of way of the Cleveland-Indianapolis division, with headquarters at Galion, Ohio, succeeding C. W. Cochran, resigned. A. F. Maischaider, engineer maintenance of way of the Cairo division at Mt. Carmel, Ill., succeeds Mr. Kegler. J. E. Kissell, engineer maintenance of way at Indianapolis, Ind., succeeds Mr. Maischaider, and L. B. Elliott succeeds Mr. Kissell.

R. C. BARDWELL, chemist of the Missouri Pacific at Kansas City, Mo., has been promoted to the position of assistant engineer in charge of water treatment of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with headquarters at St. Louis, Mo. C. H. Spaulding has been appointed chemist, with headquarters at Kansas City, Mo., in supervisory charge of water treatment on the western district and a portion of the eastern district. J. B. Westerly has been appointed chemist, with headquarters at Little Rock, Ark., in supervisory charge of water treatment of the southern district and a portion of the eastern district.

C. C. COOK, division engineer of the Pittsburgh division of the Baltimore & Ohio, at Pittsburgh, Pa., has been appointed district engineer maintenance of way of the West Virginia district at Wheeling, W. Va., succeeding W. Trapnell, resigned to accept service with another company. Mr. Cook entered the service of the Baltimore & Ohio as an axeman in the engineering department of the road, and was rapidly advanced to assistant engineer. In this capacity he served on several divisions of the company's lines until he became chief draftsman, at Cincinnati. Following this promotion he was made assistant engineer in the chief engineer's office at Baltimore, and was promoted in November, 1911, to division engineer at Philadelphia. He was transferred to Pittsburgh in May, 1913, where he has since been located.

S. D. BACON, mention of whose appointment as division engineer of the Eastern division of the Texas & Pacific, with headquarters at Marshall, Tex., was made in our February issue, was born at Denton, Tex., January 25, 1885. After leaving high school he entered railway service in August, 1901, as a chainman with the Texas & Pacific and was successively, up to December, 1907, levelman, rodman and instrumentman for this same company. From December, 1907, to January, 1909, he was instrumentman of the Atchison, Topeka & Santa Fe, engaged on the construction of the Coleman cut-off undertaking, and from January, 1909, to July, 1910, he held a similar position on the Crosbyton-South Plains line, now a part of the Santa Fe system. From July, 1910, to October, 1910, he was townsite engineer for this same company and then went to the Texas & Pacific to accept a position in the office of the chief engineer. In January, 1912, he was appointed assistant engineer of the Louisiana division, and in September, 1915, he was transferred to the Rio Grande division. From May 15, 1916, to August 5, 1916, he was engaged on special engineering work in the office of the chief engineer at Dallas, Tex., being then assigned to superintend the construction of the company's new shops at Marshall, Tex. He now becomes division engineer of the Eastern division, succeeding H. P. Moberly, resigned.

EUGENE H. SHIPMAN, superintendent of the Lehigh & New England at South Bethlehem, Pa., has been appointed chief engineer, with headquarters at the same point. He was born on March 17, 1863, at Clinton, N. Y., and began railway work as a rodman on construction work with the Delaware, Lackawanna & Western in 1881. From 1882 to 1884 he served as clerk and time-keeper with coal and lumber companies, and in the fall of 1884 entered Lehigh University, graduating as a civil engineer in 1888. After graduation he engaged in municipal engineering,

the design and construction of water supplies, power plants and sand filters, and in March, 1889, was appointed hydraulic engineer of the Lehigh Valley. From 1903 to 1908 he served as assistant engineer of the Lehigh Valley, during which time he was in charge of the construction of the Sayre, Pa., and the Towanda, Pa., grade and alignment revision. On June 1, 1908, he was appointed chief engineer of the canal department, Lehigh Coal & Navigation Company, serving in this capacity until January 15, 1909, when he was made canal superintendent, which position he held until January 1, 1916. In August, 1916, he was appointed superintendent of the Lehigh & New England, which position he held at the time of his recent appointment.

F. E. ARMSTRONG, supervisor of track of the New York Central at Richland, N. Y., was promoted to division engineer of the Ontario division, with headquarters at Oswego, on March 1, succeeding J. M. Prodmore, transferred to the Michigan division of the Lines West of Buffalo, with headquarters at Toledo. Mr. Armstrong entered the employ of the New York Central as a chainman, at Buffalo, N. Y., on January 13, 1904, since which time he has held various positions, including those of rodman, transitman, assistant engineer and supervisor of track.

H. B. REINSAGEN, principal assistant engineer of the New York Central lines west of Buffalo, at Cleveland, Ohio, has been appointed engineer maintenance of way, with headquarters at the same place. A. M. Currier, assistant engineer at Cleveland, has been appointed principal assistant engineer, succeeding Mr. Reinsagen, promoted. P. E. Manchester, assistant engineer at Cleveland, has been appointed division engineer of the Cleveland division, with headquarters at Cleveland. H. W. Fenno, resident engineer at Chicago, has been appointed division engineer of the western division, with headquarters at the same point. S. C. Upson has been appointed division engineer, with headquarters at Erie, Pa. J. M. Podmore, division engineer on the lines east of Buffalo, at Oswego, N. Y., has been transferred as division engineer of the Michigan division, with headquarters at Toledo, Ohio.

JOHN M. WEIR has been appointed chief engineer of the Kansas City Southern, with office at Kansas City, Mo. He was born in Ireland July 31, 1879, and first entered railway service with the Illinois Central in June, 1899, as a track apprentice, passing through the various engineering grades until he became resident engineer, in charge of construction, in March, 1907. He then resigned to assume charge of the construction of a small railroad being built in Canada by a copper company. After the completion of this undertaking, about nine months later, he returned to the United States and took employment with the St. Louis-San Francisco as assistant engineer, being assigned to construction work in connection with the new shops then being erected at Springfield, Mo. Subsequently he was made assistant engineer in the chief engineer's office, in charge of construction of the Gainesville & Northwestern in the state of Georgia, after the completion of which he entered the valuation department of the Chicago, Rock Island & Pacific. Shortly thereafter he was appointed assistant engineer of track on this company's Chicago terminals, and also assistant engineer, in charge of terminal valuation. In June, 1916, he was appointed division engineer of the Kansas City Southern, with office at Pittsburg, Kan., which latter position he held at the time his present appointment became effective. He succeeds C. E. Johnston, recently promoted to general manager.

CLAUDE McVEAGH THOMPSON, mention of whose appointment as division engineer of the Colorado division of the Union Pacific, with headquarters at Denver, Colo., was made in these columns last month, was born at Frankfort, Ind., January 5, 1883. Upon graduating from the Frankfort high school he entered Purdue University at Lafayette, Ind., completing a course in civil engineering. In June, 1905, he entered railway service on the Wabash division of the Cleveland, Cincinnati, Chicago & St. Louis at Wabash, Ind., as a rodman, and up to September, 1910, was promoted to instrument man and assistant division engineer in turn. In June, 1907, he went with the Oregon Short Line at Salt Lake City, Utah, as an estimator and designer in the chief engineer's office. He was transferred to the operating department as a student in railroad operation in June, 1909, and from January, 1910, to February, 1913, when he completed the course, his service covered station and yard work, track maintenance,

the handling of materials, and experience as a superintendent of a work train, a section foreman and acting roadmaster. In addition to this, he served in train operation as switchman, brakeman and conductor. After several months in the motive power department, which included some time as a roundhouse foreman, he was assigned to the accounting department and later to the offices of the division superintendent and chief dispatcher's office. On September 1, 1913, he was appointed assistant general yardmaster at Pocatello, Idaho, and on April 1, 1913, was promoted to general track foreman of the Idaho division. From June 1, 1913, to March 7, 1915, he was assistant division engineer of the Oregon Short Line. After a leave of absence from March 7, 1916, to June 10, 1916, he was appointed assistant engineer of the Union Pacific and assigned to special work in the office of the engineer maintenance of way, which latter position he held at the time of his present appointment, as noted above.

B. J. SIMMONS, whose appointment as division engineer of the Arizona division of the Atchison, Topeka & Santa Fe Coast Lines, with headquarters at Needles, Cal., has been announced previously in this column, began his railway career as a clerk in the engineering office of the Chicago & Northwestern at Chicago, Ill. In February, 1905, he went with the Chicago Junction as a rodman and later as transit man on track elevation. In 1906 he went to the Chicago, Indianapolis & Louisville as a transit man on construction, and in February, 1907, entered the Illinois Central maintenance of way department. From October, 1908, to February, 1910, he worked for the Chicago, Rock Island & Pacific and later for the St. Louis-San Francisco as topographer, levelman and estimate clerk of preliminary and location surveys in Texas. In February, 1910, he was employed by the Santa Fe as a transit man in the maintenance of way department at Fresno, Cal., and in October, 1911, was appointed assistant engineer on construction, being engaged on second track work up to October, 1914, when he was promoted to pilot engineer in the valuation department. In April, 1915, he was made assistant division engineer and in April, 1916, locating engineer, in charge of the location and construction of this company's Fallbrook branch. Upon the completion of this work he was appointed division engineer, succeeding W. L. Bradley, transferred.

TRACK

DAN KELLER has been appointed track supervisor of the Louisville & Nashville, with headquarters at Central Covington, Ky., effective March 4.

R. LEMLEY has been appointed roadmaster on the northern division of the Detroit, Toledo & Ironton, with headquarters at Adrian, Mich., succeeding George Castle.

J. H. PELTIER has been appointed supervisor of track; New York Central lines east of Buffalo, with headquarters at Richland, N. Y., succeeding F. E. Armstrong, promoted.

LOUIS VOGLAND has been appointed assistant roadmaster of the Fergus Falls division of the Great Northern, with headquarters at Park Rapids, Minn., succeeding P. F. Walsh, resigned.

S. J. GRUBBS was appointed track supervisor of the Louisville & Nashville, with headquarters at Butler, Ky., succeeding C. H. Mitchell, transferred to other duties, effective March 7.

S. E. SIMS, supervisor of roadway of the Southern Railway, with headquarters at Mobile, Ala., has been promoted to roadmaster on the Columbus division at Columbus, Ga., succeeding E. L. Beasley.

ALBERT J. ANDERSON has been appointed roadmaster on that portion of the Hastings & Dakota division of the Chicago, Milwaukee & St. Paul, between Mitchell, S. D., and Edgeley, N. D., including Aberdeen Yard, with headquarters at Aberdeen, S. D., succeeding P. H. Quinn, resigned.

W. G. ASHWORTH has been appointed roadmaster of the eighth and ninth sub-divisions of the Dakota division of the Northern Pacific, with headquarters at Mandan, N. D., succeeding F. G. Cook, transferred to the Rocky Mountain division with headquarters at Garrison, Mont., in place of C. T. Sponsel, promoted to trainmaster.

CALVIN HANKINS has been appointed assistant roadmaster of the Butte division of the Great Northern, with office at Great Falls, Minn., succeeding Harry Kemp, transferred to assistant roadmaster of the same division at Clancy, Mont. Mr. Kemp succeeds R. T. Connors, who has been promoted to roadmaster at Marcus, Wash.

B. VIOLETT, roadmaster of the Chicago, Burlington & Quincy, with headquarters at Jacksonville, Ill., has been assigned to second track work between Virden and Litchfield. C. A. Nunes, roadmaster at Brookfield, Mo., has been appointed assistant roadmaster at Beardstown, in charge of the line between Beardstown and Centralia, relieving Mr. Violett.

W. A. BUMP, supervisor of track of the Boston & Albany at Springfield, Mass., has been transferred to Pittsfield, succeeding W. A. Dearborn, transferred. He was succeeded as supervisor of track at Springfield by F. H. C. Graves. W. A. Dearborn, supervisor of track at Pittsfield, has been appointed supervisor of track at Boston, Mass., succeeding F. S. Austin, assigned to other duties.

J. E. ROLLER, formerly assistant division engineer of the Nashville, Chattanooga & St. Louis, has been appointed supervisor of track on the Nashville division with headquarters at Waverly, Tenn., succeeding C. A. Hamrick, assigned to other duties. P. E. Cunningham has been appointed supervisor of track on the same division with headquarters at McKenzie, Tenn., succeeding J. P. Kelley.

ARTHUR J. RYAN, assistant roadmaster on the Great Northern, with headquarters at Bainville, Mont., has been transferred to Fairview, Mont., incident to the subdivision of his territory on account of the construction of new lines. E. R. Robinson, section foreman and former assistant roadmaster, has been promoted to assistant roadmaster, with headquarters at Bainville, Mont., and with jurisdiction over a portion of the territory formerly in charge of Mr. Ryan.

E. O. BUFFMIRE, mention of whose appointment as roadmaster of the Illinois division of the Chicago, Milwaukee & St. Paul, with office at Elgin, Ill., was made in these columns last month, was born at Camp Douglas, Wis., on May 5, 1875. He entered railway service in 1886 as a water carrier for a construction gang on the St. Paul. After consecutively passing through several minor grades he was appointed roadmaster in 1901. In 1910 he resigned as roadmaster of this company to assume a position with a contracting concern then building a new road. He returned to the Chicago, Milwaukee & St. Paul in 1915, and was appointed roadmaster on February 14, 1917, succeeding W. H. Kofmehl, resigned.

THOMAS RALPH CONNERS, announcement of whose appointment as roadmaster of the Great Northern, with headquarters at Marcus, Wash., was made in these columns last month, was born at Hastings, Minn., August 1, 1884. He entered railway service in 1901 as a section laborer with the Chicago, Burlington & Quincy, and was soon promoted to section foreman. From May, 1907, to August of the same year he held a similar position with the Chicago Great Western and then went to the Great Northern as a section foreman. He was later made extra gang foreman, and in 1912 was appointed assistant roadmaster with headquarters at Clancy, Mont., which latter position he continued to hold until his present appointment, as noted above, became effective.

E. L. BEASLEY, roadmaster on the Columbus division of the Southern, with headquarters at Columbus, Ga., has been promoted to roadmaster of the Mobile division, with headquarters at Selma, Ala., succeeding A. D. Bradley, transferred to the Atlanta division, with headquarters at Atlanta, Ga. Mr. Beasley entered railway service as a bridge carpenter with the Western Railway of Alabama on December 28, 1889. He was promoted to bridge foreman on April 1, 1894, serving in that capacity until April 1, 1901, when he resigned to accept a position as bridge foreman with the Southern at Birmingham, Ala. On October 1, 1905, he was promoted to supervisor of bridges and buildings, also acting as supervisor of roadway at the same time. He was promoted to roadmaster of the Columbus division, with headquarters at Columbus, Ga., on October 12, 1914, which position he held until his recent appointment became effective.

BRIDGE

C. R. DAVIS, bridge foreman on the Mobile and Montgomery division of the Louisville & Nashville, has been appointed supervisor of bridges and buildings, with headquarters at La Grange, Ky., succeeding William Houston, retired.

S. A. SEELY, supervisor of bridges and buildings of the New York Central lines east of Buffalo at Watertown, N. Y., has been appointed assistant engineer, with headquarters at Utica. Jacob H. Vosburgh succeeds Mr. Seely.

W. H. HOLMES, bridge foreman on the Creston division of the Chicago, Burlington & Quincy, has been appointed acting master carpenter with headquarters at Creston, Ia., succeeding W. H. Gentle, granted leave of absence on account of illness.

PAUL WITHERSPOON, district bridge inspector on the Pittsburgh division of the Baltimore & Ohio at Pittsburgh, Pa., has been promoted to assistant division engineer and supervisor of the Staten Island Lines, with headquarters at St. George, Staten Island.

ADAM RITTER, architect of the Cincinnati, New Orleans & Texas Pacific Railway and the Alabama Great Southern Railroad, has been appointed assistant architect of the Southern Railway system with headquarters at Cincinnati, Ohio, effective March 1.

JAMES B. McCLAIN, resident engineer on the Seaboard Air Line, has been appointed bridge engineer with headquarters at Norfolk, Va. Mr. McClain entered the employ of the Seaboard Air Line as a bridge inspector in 1906 and continued in that position until 1909, when he was promoted to resident engineer in the bridge department, which position he held until the time of his recent promotion.

ERNEST H. ALLERMAN, carpenter foreman of the Great Northern, has been appointed division master carpenter with headquarters at Minot, N. D. He was born at Watertown, Wis., October 13, 1866. After leaving school, he entered railway service with the Chicago, Milwaukee & St. Paul, since which time up to May, 1906, he has been employed on several western roads as carpenter and carpenter foreman. In 1906 he was appointed carpenter foreman of the Great Northern, which latter position he continued to fill up to the time his present appointment as division master carpenter became effective. He succeeded Thomas Gardner, assigned to other duties.

OSCAR F. DALSTROM, chief draftsman of the Chicago & North Western, with office at Chicago, Ill., has been appointed bridge engineer, with the same headquarters. He was born at Wyand, Ill., August 15, 1871, and graduated from the Rensselaer Polytechnic Institute in 1901. In June, 1906, he entered railway service with the Chicago & North Western as a draftsman in the bridge department, prior to which time he had been employed for several years by the Pennsylvania Steel Company as a bridge draftsman and shop inspector on bridge work. On June 1, 1909, he was appointed chief draftsman, which position he held until February, 1915, when he assumed the duties of the office of bridge engineer, succeeding W. C. Armstrong, who resigned to become chief engineer of the St. Paul Union Depot Company. Mr. Dalstrom received the title of bridge engineer on March 1, 1917.

WENDELL P. BALL, whose appointment as district bridge inspector of the Cincinnati, Hamilton & Dayton and the north-west district of the Baltimore & Ohio, with headquarters at Cincinnati, Ohio, was noted in these columns last month, was born at Sherman, New York, September 28, 1888. He graduated in civil engineering from Allegheny College, Meadville, Pa., in June, 1910. On March 12, 1912, he entered railway service with the Baltimore & Ohio as an axman in the survey department at Baltimore, Md., being assigned to the maintenance of way department at Pittsburgh, Pa., a year later, as rodman. From March 23, 1913, to September 16, 1913, he was chairman in this same department, and from September 16, 1913, to November 15, 1914, he was general foreman on new construction at Eighty Four, Pa. He was made topographer in the valuation department of the Cincinnati, Hamilton & Dayton on December 15, 1914, and retained this position up to June 1, 1916, when he was appointed transitman in charge of field work, with headquarters at Cincinnati, Ohio. He was appointed assistant engineer, maintenance of way department, in charge

of second track work from Trenton, Ohio, to South Dayton, on September 10, 1916. The position to which he has just been appointed is a newly created one.

PURCHASING

F. E. CARRERO has been appointed local purchasing agent for the Constitutional Railways of Mexico, with headquarters in New York City.

E. LANGHAM, purchasing agent for the Canadian Northern lines west of Port Arthur, with headquarters at Toronto, Ont., has been given the title of general purchasing agent, and his authority has been extended over the system.

ROBERT T. PACE, who has been temporarily relieved of his duties as purchasing agent of the Atlanta & West Point and the Western Railway of Alabama, at his own request, will devote his entire time to his position as superintendent of the Atlanta Terminal Company, J. A. Best will act as purchasing agent, with office at Augusta, Ga., until further notice.

FRANK S. AUSTIN, supervisor of track of the Boston & Albany at Boston, Mass., has been appointed to the newly created position of general storekeeper with headquarters at West Springfield, Mass. Mr. Austin was born at Lynn, Mass., on November 6, 1886, and after graduating from Dartmouth College in 1909 he entered the employ of the Boston & Albany as assistant supervisor of track at Pittsfield, Mass. In 1913 he was appointed supervisor of track at Worcester, Mass., and in 1916 he was transferred to Boston as supervisor of track, which position he held at the time of his recent appointment.

OBITUARY

WILLIAM A. VAN MATER, engineer maintenance of way of the New Jersey Southern division of the Central Railroad of New Jersey at Long Branch, N. J., previous to 1906, died on March 9 at Red Bank, N. J., at the age of 68 years.

SIMON CAMERON LONG, general manager of the Pennsylvania Railroad, died on apoplexy on a train near Philadelphia, on March 25. He was born in Dauphin county, Pa., on September 7, 1857, and after graduating from the civil engineering course at Lafayette College, Easton, Pa., in 1887, he entered the service of the Pennsylvania Railroad as a rodman on construction on April 3, 1881. On November 25, 1882, he was appointed assistant supervisor of the Pittsburgh division, and on February 1, 1885, he was promoted to supervisor on the Monongahela division. On August 1, 1901, he was made superintendent of the Bedford division, being promoted to general superintendent of the Western Pennsylvania division on April 1, 1907, and general manager of the lines east of Pittsburgh and Erie on March 3, 1911.

F. W. STILES, general roadmaster of the Great Northern, with headquarters at Spokane, Wash., whose death as a result from injuries inflicted by a falling derrick boom at Highland, Wash., was noted in these columns last month, was born at St. John, Mich., in 1871. He entered railway service in 1888 with the Ann Arbor as a section hand. In a short time he was promoted to section foreman, and then extra gang foreman. He was appointed roadmaster in 1906. Later he was appointed assistant roadmaster of the Cascade division of the Great Northern at Pasco, Wash., and a year later he was promoted to roadmaster on this same division. In 1913 he was appointed division roadmaster with headquarters at Spokane, Wash.

WALTER KATTE, for 13 years to 1899 chief engineer of the New York Central, and who for many years was actively engaged in railroad and bridge construction work in various parts of the United States, died suddenly on March 4, at his home in New York City, at the age of 87. He was born in London, England. He began railway work in 1850 as clerk and draftsman to the chief engineer of the Central of New Jersey. At the outbreak of the Civil War he became colonel of an engineer regiment of the Union army. He was superintending engineer of erection of the Eads bridge at St. Louis. He served as chief engineer on the Third and Ninth avenue elevated railways, in New York City, from 1877 to 1880; during the next six years he constructed the West Shore Railroad, and when the railroad was taken over by the New York Central he became chief engineer of the New York Central also. During his administration the Central line in Park avenue, New York, was rebuilt on an elevated structure. He retired in 1899.

CONSTRUCTION NEWS

THE ANTHONY & NORTHERN has awarded a contract to F. M. Thompson, Larned, Kan., for the grading of an extension from Larned, Kan., to Hays City, 57.3 miles. About 8,000 cu. yd. of material will be handled per mile, the maximum grade will be 0.80 per cent and the maximum curve 5 deg. A pile trestle 476 ft. long will be erected over the Smoky Hill river, and about 20 other smaller bridges will be built. This work, including all track laying, will be done by the company's own forces.

THE ATLANTIC COAST LINE and the Richmond, Fredericksburg & Potomac have jointly awarded a contract to W. W. Boxley & Co., Roanoke, Va., for a bridge over the James river at Richmond. It is to be a double-track concrete arch bridge, with 3 60-ft. spans and 15 116-ft. spans.

THE BARTON COUNTY & SANTA FE has been granted a charter to construct a railroad from Holyrood, Kan., through Barton and Rice counties to Galatia, a distance of about 32 miles. Contracts for this undertaking will soon be let.

THE BUFFALO, ROCHESTER & PITTSBURGH plans to build a powerhouse, machine shop and other facilities at East Salamanca, N. Y., this year at a cost of about \$200,000.

THE CAROLINA, CLINCHFIELD & OHIO plans to begin work this spring on a brick and concrete passenger station at Kingsport, Tenn., which will cost approximately \$50,000. The structure will be one story high, 40 ft. wide and 160 ft. long.

THE CENTRAL OF GEORGIA has completed plans and opened bids for the construction of freight terminals at Macon, Ga. The work will include the construction of a two-story office building about 40 ft. by 130 ft. and an inbound freight house about 50 ft. by 600 ft., of brick and concrete construction, and a concrete outbound freight shed, 30 ft. by 800 ft.

THE CHESAPEAKE & OHIO has awarded a contract to Board & Duffield, Charleston, W. Va., for grade separation work at Tenth street, Huntington, W. Va. The street is to be carried under five tracks and a station platform. The estimated cost of the work is \$75,000.

THE CHICAGO & EASTERN ILLINOIS has awarded a contract to John J. O'Heron & Company, Chicago, Ill., for the construction of a new bridge over the Okaw river, just north of Findlay, Ill. There will be three 100-ft. and two 50-ft. concrete arches, for which about 17,000 cu. yd. of concrete will be required. The cost of this structure, including the necessary grading for the approaches, will be \$275,000.

THE CHICAGO & ILLINOIS MIDLAND has been granted a certificate of necessity and convenience to extend its line from Auburn, Ill., to Compro, a distance of 3½ miles. Contracts have already been let and the estimated cost of the work is \$75,000. The grading will average about 10,000 cu. yd. per mile, the maximum grade will be 0.03 per cent, and the maximum curve 3 deg. Two interlocking plants and towers will be built at crossings with the Chicago & Alton and the Illinois Traction. This extension will provide a connection with the Chicago & North Western.

THE CHICAGO & NORTH WESTERN has let a contract to the C. W. Gindele Company, for an extension to its machine shop building at Chicago, Ill., approximately 183 ft. by 208 ft., one story in height. Extensions will also be added to two store buildings, one 50 ft. by 200 ft. and two stories in height, and the other 58 ft. by 200 ft., one-half of which will be two stories high and the other one-half one story. Work will be started on these extensions as soon as material can be assembled.

THE CHICAGO, BURLINGTON & QUINCY plans soon to build a dining room at Cody, Wyo., for the convenience of its patrons visiting Yellowstone National Park. The dining room will be enclosed in glass and will accommodate 250 persons at one time. In addition there will be a large lounging room and other conveniences for tourists. It is hoped to have the work completed by June 20 when the park season opens. The estimated cost of this work will be \$25,000.

This road has postponed for about thirty days the awarding of contracts for the construction of the proposed line from Monroe, Mo., to a point 3½ miles west of Moberly, a distance of 46 miles.

This road has commenced work on a reinforced concrete bridge across the Platte river, near Grand Island, Neb., which will consist of four 20-ft. and twenty-six 25-ft. concrete slab spans and six 60-ft. steel deck girder spans on concrete piers. This project, including the improvement of the alignment and grades on approximately five miles of line, will cost about \$100,000.

THE CHICAGO, MILWAUKEE & ST. PAUL has started work on new terminal facilities at Atkins, Iowa. These improvements include the erection of 10 new buildings, a 26-stall roundhouse, a Robertson cinder hoist, a coal handling plant, a machine shop and powerhouse, the laying of about 68,500 lineal ft. of new tracks and 240,000 cu. yd. of grading. The estimated cost of this work is \$650,000.

This road has awarded contracts for the construction of an extension from a point on its Blackfoot branch near Clearwater, Mont., to Lincoln, a distance of about 33 miles. With this extension built, half of the connecting line between Missoula, Mont., and Great Falls will be completed.

THE CHICAGO, ROCK ISLAND & PACIFIC has awarded a contract to the T. S. Leake & Company, Chicago, Ill., for the construction of a new passenger depot at Marseilles, Ill. The building will be one story high, of brick and stucco construction and will cost about \$20,000. The plumbing contract was let to Johnson & Beck, Topeka, Kan.

THE ENID & NORTHWESTERN has been organized with a capitalization of \$400,000 for the construction of a road from Fairmount, Okla., to Bliss, a distance of about 35 miles, thence to Tonkawa, 10 miles further.

THE ERIE has secured approval of its plans by the New Jersey Board of Public Utility Commissioners for the elimination of grade crossings at Park avenue and Rutherford station, Rutherford, N. J. These plans include the construction of island platforms between four main line tracks at the station and a subway under the tracks.

THE EVANSVILLE & INDIANAPOLIS has awarded a contract to the W. E. Callahan Construction Company, Omaha, Neb., for extensive realignment work between Terre Haute, Ind., and Evansville, a distance of about 150 miles.

THE GREAT NORTHERN will award contracts as soon as the weather permits for the double tracking of its line between Shelby, Mont., and Cutbank, a distance of about 24 miles. Other double tracking between Whitefish, Mont., and Columbia Falls will also be undertaken in the near future.

THE GULF, MOBILE & NORTHERN, formerly the New Orleans, Mobile & Chicago, is now extending its line north from Middleton, Tenn., to Jackson, about 40 miles. A contract for the construction of the roadbed and bridge sub-structures on the southerly 20 miles has been let to W. O. Wogan, Denver, Colo., and contracts for the remainder of the line will be awarded at an early date. About one-half of the grading will be steam shovel work and the balance of a lighter character. There will be one through truss bridge of approximately 100-ft. span, and a single-track tunnel 500 ft. long. The line is being built with a maximum grade of 0.6 per cent and a curvature of 3 deg.

THE ILLINOIS CENTRAL will increase its mechanical facilities at Palestine, Ill., by the addition of six 100-ft. stalls to the present roundhouse, a new combination office and storehouse, 30 ft. by 70 ft., a machine shop and a power house, 40 ft. by 100 ft., all brick construction with steel trusses. Smaller additions include a brick sand drying house, a cinder pit with double Robertson conveyors and a 125-ft. concrete smokestack. The estimated cost of the improvement is about \$100,000.

THE JACKSONVILLE TERMINAL COMPANY has awarded a contract to Irwin & Leighton, Philadelphia, Pa., to build a passenger station, baggage building and subway at Jacksonville, Fla. The buildings will be of structural steel, concrete, brick and limestone construction and will cost \$750,000.

THE LEHIGH VALLEY plans extensive improvements at East Buffalo, N. Y., and Tift Farm, and has awarded contracts to Westinghouse, Church, Kerr & Company, New York, for their construction. The work at East Buffalo includes a 22-stall

reinforced concrete enginehouse, a 100-ft. electrically-operated turntable with an emergency air auxiliary, a 250-ft. steel and concrete double-track water and ash pit, a gantry crane to remove the ashes, and blacksmith, machine and boiler shops. The Tift Farm improvements include a 15-stall addition to the present enginehouse, a turntable, drop pits, double-track water and ash pits and machine, oil and power houses. Provisions will also be made for offices, locker and tool rooms.

This road has awarded a contract to the R. D. Richardson Construction Company, Scranton, Pa., to build a freight terminal on the west side of Vine street and south of the present freighthouse at Hazelton, Pa. The work includes a new brick freight station, 40 ft. wide and 300 ft. long, with a second story, 40 ft. by 50 ft., for offices, a large concrete freight transfer platform, ample team tracks and paved driveways.

THE MIDLAND VALLEY has awarded a contract to the Railroad Water & Coal Handling Company, Chicago, Ill., for the construction of a Miller continuous water softening plant, having a capacity of 10,000 gals. per hour, to be located at the Lafaber yard near Tulsa, Okla.

THE NEW YORK, NEW HAVEN & HARTFORD plans soon to let contracts for the building of a line from South Bay Junction, Mass., to the Boston freight terminal, a distance of about three-fourths of a mile. The work involves the handling of about 116,000 cu. yd. of excavation, 6,300 cu. yd. of gravel filling, 15,000 cu. yd. of concrete masonry, the construction of 11 overhead bridges, which will require 1,130 tons of steel, and 7,830 cu. yd. of concrete masonry, and a pumping plant.

THE NORTHERN PACIFIC has awarded contracts for the construction of a low grade freight line between Logan, Mont., and Bozeman, a distance of about 33 miles. The grade between these two points will be 0.4 per cent. The estimated cost of the undertaking is \$2,000,000.

THE OREGON SHORT LINE is improving its terminal facilities at Nampa, Ida., by the construction of a six-stall enginehouse, with two additional stalls to serve as a machine shop; a boilerhouse, a 92-ft. turntable, an oilhouse, an ashpit, etc. About \$100,000 will be spent on these improvements, the work being done by company forces.

THE PENNSYLVANIA DETROIT has filed articles of incorporation at Lansing, Mich., with a capital stock of \$5,000,000, to build a 52-mile line from the Ohio-Michigan state line northward through Monroe and Wayne counties to Detroit.

THE PENNSYLVANIA LINES WEST have awarded a contract to P. T. Clifford & Son, Valparaiso, Ind., for additional yards and new engine facilities at Akron, Ohio, which will require about 100,000 cu. yd. of grading. The contract price of this work is \$286,000.

THE PENNSYLVANIA RAILROAD plans to replace its present bridge over Twenty-fourth street, Altoona, Pa., with a new structure, the work being done by company forces.

This road plans to relocate its passenger station and to enlarge the yard at Princeton, N. J.

THE PHILADELPHIA & READING has awarded a contract to L. F. Shoemaker, Pottstown, Pa., for the superstructure of a bridge to be built over Ridge avenue at Laurel Hill, Philadelphia. The new bridge will consist of three through plate girder spans about 90 ft. long and will replace the existing deck structure.

This road has awarded a contract to W. H. Wiand, Pottstown, Pa., to build a new passenger and freight station at Douglassville, Pa., to replace the structure destroyed by fire about two months ago. The new building will be a one-story and attic brick structure.

THE SAN DIEGO & ARIZONA has awarded a contract to the Utah Construction Company, Ogden, Utah, for about 20 miles of grading, running into the Imperial valley of California. As the country through which the line will run is very rough and mountainous, the grading will be extremely heavy. The bridging and track laying will be let to another company.

THE SEABOARD AIR LINE is making plans for improvements at Andrews, S. C., which will include a combination freight and passenger station, coal elevator, sandhouse, cinder pit, turntables and tracks, boilerhouse, coal trestle, lead and yard tracks.

THE SOUTHERN RAILWAY has awarded contracts for the construction of 26.3 miles of double track on the Alabama Great Southern, between Birmingham, Ala., and Meridian, Miss. Between Burstable, Ala., and Vance, 21.8 miles of second track will

be laid parallel to the present line and between Toomsaba, Miss., and Russell, 4.5 miles a new double-track line involving heavy grading and giving improved grades with reduced curvature will be constructed. This work will complete the double track from Irondale, through Birmingham, to Vance and from York to Meridian.

This road is making improvements between Morristown, Tenn., and Salisbury, N. C., a distance of 228 miles. These improvements include the replacing of all frame trestles in this section with permanent structures of steel and concrete, the construction of 18 new steel bridges to replace lighter structures, the encasing of 5 stone and brick arches with reinforced concrete, the elimination of 119 trestles by the construction of 6 underpasses for highways and 14 concrete culverts, and the filling of the remaining trestles, and the placing of large concrete and cast iron pipes for drainage openings.

THE SOUTHERN PACIFIC has approved plans for the construction of a series of five concrete piers at Galveston, Tex., similar in design and construction to Pier B in the west end of the city, at a cost of between \$4,000,000 and \$5,000,000. Provision will also be made for a single concrete and steel pier to be used exclusively for foreign trade.

THE UNION PACIFIC has awarded a contract to James F. Stewart & Co., St. Louis, Mo., to erect a new brick and stone passenger station at North Platte, Neb., at a cost of \$120,000.

This road is planning to construct permanent concrete snow sheds at various points along its lines at an estimated cost of about \$1,000,000.

It has also awarded a contract to Westinghouse, Church, Kerr & Co., New York City, to build a power house for a central power station at Omaha, Neb. The building will be of brick and steel, 76 ft. wide and 209 ft. long, with a concrete foundation. The cost of this work is approximately \$450,000.

TRACK MATERIALS

THE ALASKA ENGINEERING COMMISSION has placed an order with the United States Steel Products Company for rails, angle bars, track bolts and spikes, which will amount to approximately \$467,000.

THE BELGIUM STATE RAILWAYS have issued an inquiry for about 25,000 tons of 85-lb. rails.

THE BOSTON & ALBANY is reported to be in the market for 10,000 kegs of spikes for delivery in the first quarter of 1918.

THE FRENCH GOVERNMENT has ordered 50,000 tons of steel rails for 1918 delivery from the United States Steel Corporation.

THE MICHIGAN CENTRAL has ordered 7,000 tons of rails from the Illinois Steel Company for 1918 delivery.

THE NEW YORK, NEW HAVEN & HARTFORD is reported inquiring for 10,000 kegs of spikes for delivery in the first quarter of 1918.

THE PENNSYLVANIA RAILROAD has placed orders for 68,332 tons of steel rails for delivery in 1918, divided as follows: Bethlehem Steel Company, 19,133 tons; Cambria Steel Company, 15,033 tons; Lackawanna Steel Company, 4,100 tons, and United States Steel Corporation, 30,066 tons. This compares with a total of 205,000 tons ordered for delivery in 1917. The price will be \$40.80, as compared with a price of \$30.80 a ton, which is being paid for the rails ordered for delivery during the current year. Of the 1918 order 41,666 tons are for the Lines East and 26,666 tons for the Lines West.

THE PERE MARQUETTE has ordered 10,000 tons of rails for 1918 delivery.

STRUCTURAL STEEL

THE CHICAGO & NORTH WESTERN has ordered 577 tons of steel from A. Bolter Sons Company for a machine shop at Chicago.

THE MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE has ordered 510 tons of steel for one deck girder span and 5 riveted truss spans at Chippewa Falls, Wis.

THE PENNSYLVANIA LINES WEST have ordered 1,500 tons of steel from the Fort Pitt Bridge Works, 1,300 tons from the McClintic-Marshall Company, and 1,000 tons from the American Bridge Company for grade elimination work in Chicago.

THE ST. LOUIS-SAN FRANCISCO has ordered 1,004 tons of steel from the McClintic-Marshall Company for various deck plate girder bridges.

SUPPLY TRADE NEWS

GENERAL

THE WALTER A. ZELNICKER SUPPLY COMPANY, St. Louis, Mo., has purchased the Idaho Southern, which discontinued operation some time ago and which runs from Gooding, Idaho, to Jerome, and the Milner & North Side, a short line running from Milner, Idaho, to Oakley. The total mileage of the two roads is about 50 miles. The roads, which were built a few years ago by Pittsburgh capital, will be dismantled, and all the ties, rails, spikes and other equipment sold.

THE DODGE MANUFACTURING COMPANY, Mishawaka, Ind., announces the acquisition of the properties and products of the Oneida Steel Pulley Company and the Keystone Steel Pulley Company of Oneida, N. Y. The Dodge Steel Pulley Corporation was formed to control the two Oneida companies, and will be a subsidiary of the Dodge Manufacturing Company. The new corporation has been authorized to increase its capital stock from \$550 to \$550,000, resulting in an increase of shares of from 10 to 10,000. The sale and distribution of products of the corporation will be under the supervision of the Dodge Sales & Engineering Company, Mishawaka, Ind.

PERSONAL

CASS L. KENNICOTT has recently become associated with the Permutit Company of New York, in charge of its Chicago office.

FERDINAND W. ROEBLING, treasurer and general manager of J. A. Roebling's Sons Company, died at his home in Trenton, N. J., on March 16.

ERNEST L. RANSOME, founder of the Ransome Concrete Machinery Company, died March 5 at his home in Plainfield, N. J., at the age of 73 years.

THE Q & C COMPANY, New York, has opened a branch office in St. Louis, Mo., No. 1942 Railway Exchange building, under the direction of John L. Terry.

M. B. MYERS, assistant to the vice-president of the American Manganese Steel Company, has been appointed sales manager with headquarters at Chicago, Ill.

CYRUS H. LOUTREL, factory manager of the National Lock Washer Company, Newark, N. J., for the past six years, has been elected president of the company, to succeed the late William C. Dodd, who died suddenly on March 12.

WILLIAM C. DODD, president of the National Lock Washer Company, Newark, N. J., died suddenly at his home in East Orange, N. J., Monday morning, March 12. He was 46 years old. Mr. Dodd had been connected with the National Lock Washer Company since 1886. He was secretary and treasurer of the company for many years, and succeeded his father as president upon the death of Mr. Dodd, senior, 12 years ago.

JOHN F. ALDEN, formerly president of the Rochester Bridge Company, and more recently contracting manager of the American Bridge Company at Rochester, N. Y., died at his home in that city on February 27, at the age of 64. Mr. Alden built the upper suspension bridge at Niagara Falls, N. Y., and the bridge over the Columbia River at Pasco, Wash., as well as many others throughout the United States.



WM. C. DODD

W. S. RUGG, formerly district manager of the New York office of the Westinghouse Electric & Manufacturing Company, has been appointed manager of the railway department, with headquarters at East Pittsburgh, Pa., succeeding Charles S. Cook.

ALEXANDER P. ROBINSON, formerly vice-president and treasurer of the Cambria Steel Company, died at his home in New York City on February 16, from hardening of the arteries. He was 53 years old. Mr. Robinson retired from the Cambria Steel Company on its consolidation with the Midvale Steel & Ordnance Company, and had since resided in New York.

LAMBERT T. ERICSON, formerly engineer of the American Creosoting Company, New York City, has become associated with the Jennison-Wright Company, Toledo, Ohio, in the capacity of contracting engineer. It is further announced that George L. Luck, until recently associated with the Hastings Pavement Company, New York City, has been placed in charge of street paving sales of the Jennison-Wright Company.

PETER SIEMS, president of the Siems-Carey Company, railroad contractors, St. Paul, Minn., died suddenly at Daytona, Fla., on March 3, at the age of 75 years. As a member of several contracting firms, he participated in the construction of a large mileage of railways in the Northwest, including the Pacific Coast extension of the Great Northern in 1893. As president of the Siems-Carey Company he took part in the recent negotiations leading to the award of a \$100,000,000 contract to this company for the construction of railways in China.

JOHN KASSON HOWE, director of the Osgood Company, Marion, Ohio, and its eastern sales representative, died at his home in Albany, March 4. The Osgood Dredge Company of Albany, N. Y., was organized by Mr. Howe in 1883, and this company obtained the original patents on the boom type dredge, which general design is followed by all the leading dredge builders at this time. Mr. Howe was secretary and treasurer of the Osgood Dredge Company until its consolidation with the Osgood Company, Marion, Ohio, when he became a director in the latter company and its eastern sales representative.

E. J. CALDWELL, in charge of the railroad sales department of the Barrett Company in the Chicago territory, has been made manager of the general railroad sales department of the Barrett Company, with headquarters at New York, succeeding E. H. Poetter, who has been placed in charge of the export department of this company. Mr. Caldwell entered railroad service with the Illinois Central in 1898 as a stenographer for the supervisor of track at Champaign, Ill. In the following year he became clerk for the trainmaster at Freeport, Ill., and in 1900 was stenographer for the division superintendent at the same point. Late in the same year he became a stenographer in the office of the vice-president of the Seaboard Air Line at Portsmouth, Va. The following year he returned to the Illinois Central as secretary to the general superintendent of transportation, and later in the same year he became secretary to the general superintendent of the Chicago, Rock Island & Pacific at Little Rock, Ark. In the fall of 1902 he became secretary to the chief engineer of the Illinois Central. Early in 1904 he was appointed secretary to J. T. Harahan, second vice-president of the Illinois Central, and accompanied Mr. Harahan when he was elected president of the same road. In 1910 he became acting chief clerk in the office of the president. In March, 1911, he left railway service to become a railroad representative of the Barrett Company in Chicago, and later organized and was placed in charge of the first railroad sales department of this company.



E. J. CALDWELL



Truscon Steel Buildings

—What They Are

—How They Are Built

Every railroad officer who may have emergency need for a building should know the Truscon Steel Buildings. You can read between the lines of the summary following, their convenience, ease of assembly, safety and portability. A primer is necessarily elementary; a consideration which may excuse the brevity of the grouping of facts.

FOUNDATIONS—Any affording means of attachment for wall panels. Concrete or timber. Must be level and drained free of water.

FLOORS—Concrete, wood or gravel.

WALL PANELS—Of best grade No. 18 gage open-hearth steel. Paneled in relief under powerful presses. Wall units are either 2 or 4 ft. wide and of standard height of 7 ft. 10 in. Bead in center of 4-ft. panels allows expansion and contraction. Stiffening flange extends completely around panels and fits steel mullions used between panels. Bottom flange punched for attaching to foundation.

CORNER PANELS—Three types of units, 2 ft. each side, 1 ft. each, and 2 ft. one side and 1 ft. the other. Panels are continuous around corners, and weatherproof.

VENTILATING PANELS—Upper paneling of a 4-ft. unit is cut away and steel sash and frame, pivoted at the top and equipped with push bar and locking device, substituted. Sash is glazed after erection.

DOORS—Of reinforced hollow metal. Single doors are 4 ft. wide and 7 ft. 10 in. high, either solid or with glass upper panel. All single doors have steel above

to complete standard panel height. Double doors 8 ft. wide, either solid or with glazed upper panel. Have top and bottom bolt, operated by handle and cam movement. All doors have standard Yale lock, spring latch, cylinder style, suitable handles and Stanley hinges.

ROOF TRUSSES—Various widths. Of pressed steel members, electrically welded at all connections. Gusset plates at ends fit between wall panels and set on the mullions. Both upright and side bracing give rigidity.

GABLE PANELS—Of pressed steel for any desired width of building. Shipped in units for convenience of erection.

ROOF PLATES—Of open-hearth steel, shaped into special sections with water-tight interlocking joints on edges and ends equipped with special joint strips. In three forms, ridge, intermediate and eaves. Laid longitudinally and fastened to trusses by special clips.

CONNECTION OF MEMBERS—A special slotted bolt is slipped through holes punched in the sections, the wedge placed and driven home with a hammer, the only erecting tool required.

Long experiment and wide experience are behind every principle embodied in the design of these buildings. Their scope of usefulness on railroads is notably wide and varied. We shall be glad to make suggestions showing their application to your particular building requirements, and to furnish you with catalogue containing detailed description.



TRUSSED CONCRETE STEEL COMPANY
RAILROAD DEPARTMENT, YOUNGSTOWN, OHIO
REPRESENTATIVES IN PRINCIPAL CITIES





THE COMMITTEE ON BALLAST OF THE A. R. E. A.

in a recent report stated, "It is generally conceded that stone is the most effective ballast," a fact which is further emphasized by the installation by many railroads of company-operated crushing plants for the preparation of ballast.

This movement has made the problem of "the most effective and economical crushers for such service," an important one to the railroad officials of to-day. A problem which can be solved definitely through the installation of

TRAYLOR Crushers

Noted for absolute reliability and serviceability, possess special features of design and construction which especially commend them for both efficient and economical operation of railroad stone crushing plants.

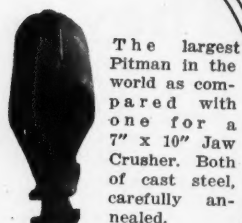
Traylor Jaw Crushers

The heart of a Jaw Crusher is its bearings. Size makes no difference, hence all sizes of Traylor Jaw Crushers are provided with water-cooled main bearings and pitman. What is the result—longer life and less attention than those of other types. Think what that means in elimination of bearing troubles and expense.

Traylor Gyratory Crushers

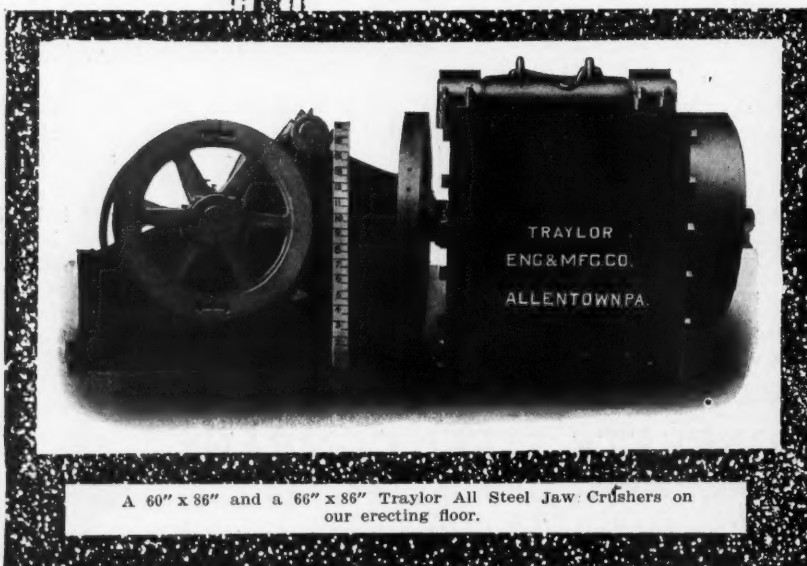
The eccentric in these crushers is so designed that every portion of the bearing surface receives proper lubrication. You know what this means—no babbitt to heat, crack, crumble and work down into the eccentric, thus causing undue heating as is so often the case in other types of Gyratory Crushers.

The Traylor eccentric affords greater bearing surface than that of any other Gyratory Crusher, with the result that the pressure per square inch is greatly reduced. This feature is important, as it greatly eliminates the chance of anything going wrong and putting the crusher out of commission. Further, the eccentric is designed so that hard grease may be used as a lubricant, thus preventing dust and dirt from working into it. Dust and dirt cannot settle through a heavy grease, hence as the new grease is forced into the bottom of the eccentric, the dust and dirt are forced out at the top of this cavity with the old grease.



The largest Pitman in the world as compared with one for a 7" x 10" Jaw Crusher. Both of cast steel, carefully annealed.

Both water cooled.



A 60" x 86" and a 66" x 86" Traylor All Steel Jaw Crushers on our erecting floor.

Use The Coupon

Do It No

Traylor Crushers

Jaw and Gyratory types, are noted for their Absolute Reliability, Serviceability and Economy. Owing to their special features and construction, the

pitman and pitman shaft bearings in the Jaw Crushers and the eccentric in the Gyratory type, these important parts require a minimum of attention, perhaps less than those parts in any other crushers on the market.

Traylor Crushers are ideal for the preparation of stone for ballast. No matter what your requirements are, investigate, and you will find that for Absolute Reliability, Serviceability and Marked Economy you must install Traylor Crushers.

Send for illustrated bulletins, those handy booklets explaining why Traylor Crushers make such moderate demand for horse power per ton of rock crushed, giving the reasons why they assure the handling of large quantities of material at most reasonable expense. You need these books.

Traylor Engineering & Manufacturing Co.

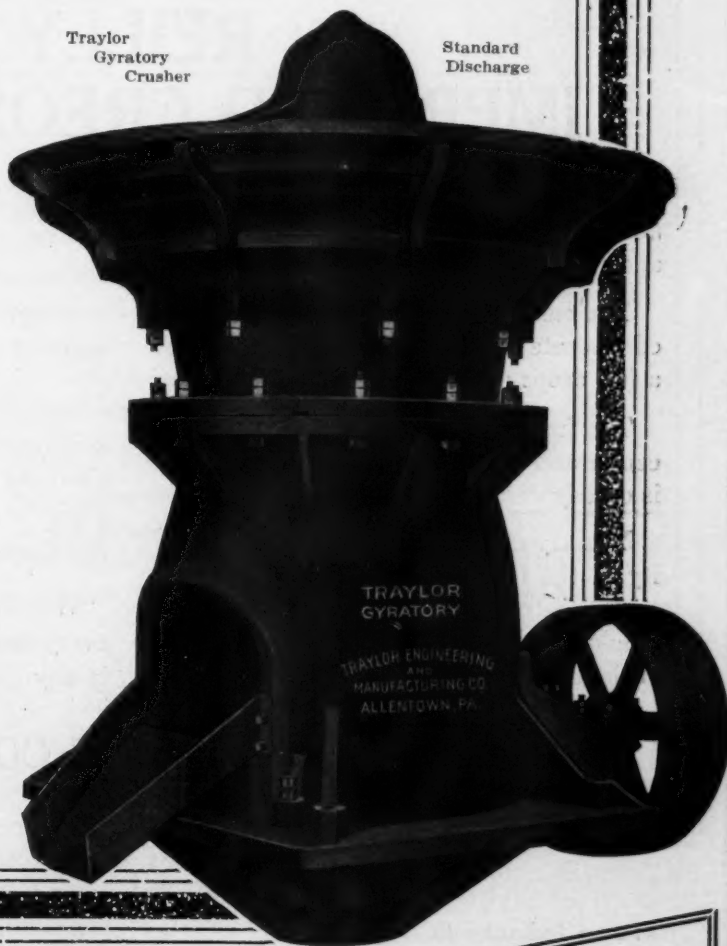
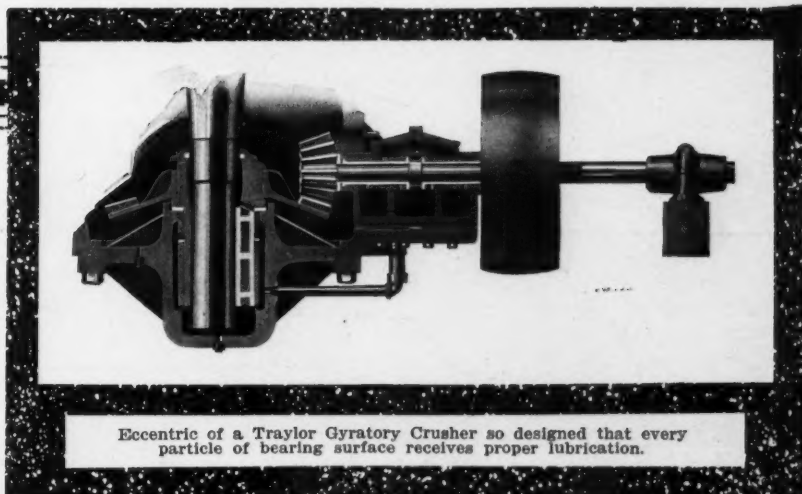
ALLENTOWN

PA., U. S. A.

30 Church St.
New York

1414 Fisher Bldg.
Chicago

Newhouse Bldg., Salt Lake City

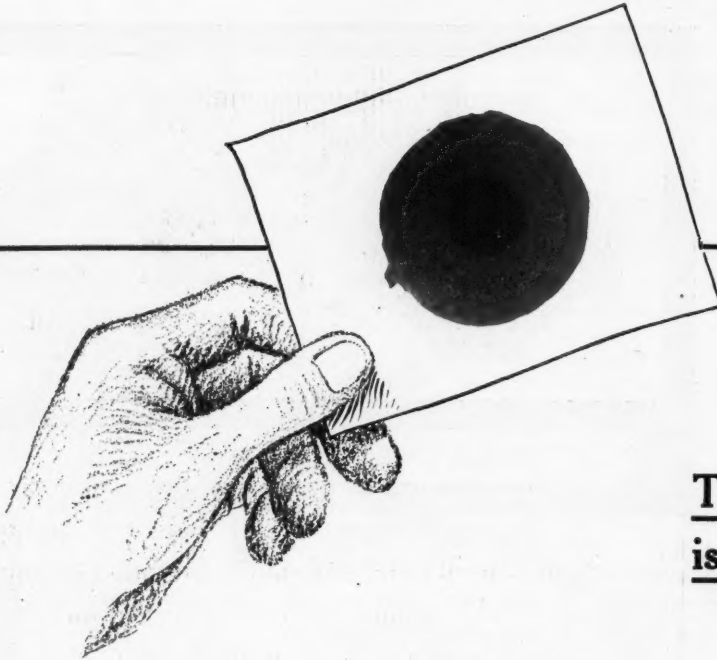


Do It Now

TRAYLOR ENGR. & MFG. CO.,
Allentown, Pa.

Absolute Reliability, Serviceability, and Economy combined in a crusher for the preparation of ballast interests me. Please send me bulletins fully describing Traylor Crushers.

Name.....
Address.....



The Spot Test
is welcomed by

REILLY IMPROVED CREOSOTE OIL

A creosote oil that contains tar, free carbon or other extraneous matter is **impure** and will not permanently preserve wood.

You can detect impurities in a suspected creosote oil almost instantly by placing a few drops on clean blotting paper.

The impurities gather in a spot in the center and in a short time their presence is clearly defined in a distinct "zone."

You try it. The accuracy and simplicity of the test will convince you that it tells the truth. Diesel Engine Users of England have adopted the "spot test" for their fuel oils.

Reilly Improved Creosote Oil welcomes this test because the oil is **pure**; it renders perfect preservation; it stays in the wood; it remains in the fibres until their last spark of mechanical life is exhausted.

The purity, effectiveness, unchangeability and permanence of Reilly Improved Creosote Oil make it the ideal preservative for wood blocks, ties, timbers, interior floors, etc.

We can furnish treated timbers of every description or the oil itself in any quantities.

REPUBLIC CREOSOTING COMPANY

1416 Merchants Bank
Indianapolis, Ind.

Plants: Indianapolis
Mobile
Minneapolis
Seattle

REPUBLIC CREOSOTING COMPANY,
1416 Merchants Bank, Indianapolis, Ind.
Please send me simple method for determining impurities in creosote oils.
Name
Address
City
State

Cleanliness and Efficiency Go Hand in Hand



Upon the health and comfort of your track gangs largely depend their efficiency. Sanitary sleeping quarters are essential to healthful conditions and cleanliness is of prime importance. *Wooden bunks cannot be kept clean except at a prohibitive expenditure of time and money. But why go to this trouble?*

Romelink All Metal Bunks

solve the problem in the logical way—by a construction that positively cannot collect dirt or harbor vermin. The *sagless* spring makes an easy, comfortable bed, and is practically indestructible. The steel frame is hand riveted and cannot work loose.

Romelink bunks are by far the cheapest in the end, when you consider the greater comfort, cleanliness and durability as well as greatly reduced fire-hazard in your bunk cars. The coupon below is for your convenience in securing full particulars. Fill it out and mail today. No obligation.

Southern Rome Co.

633 West Pratt St.


Baltimore, Md.



Southern Rome Co.
633 W. Pratt St., BALTIMORE, MD.

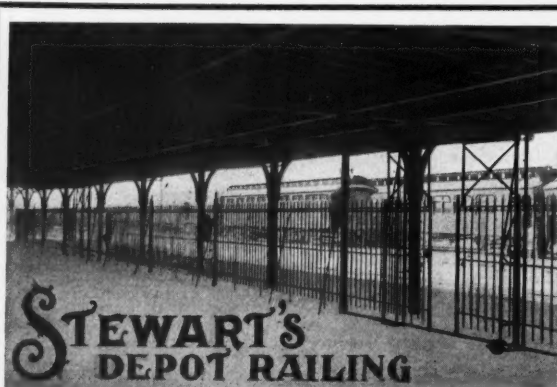
Gentlemen:—Without obligating myself in any way, kindly send me complete details, blueprints and illustrations of Romelink Bunks.

NAME.....
ADDRESS.....
RAILROAD..... POSITION.....

**THE
BEST PIPE
FOR
RAILROAD CULVERTS**
 WHETHER FROM THE STANDPOINT OF
COST, INSTALLATION OR MAINTENANCE
 IS
 "QUALITY"  "ECONOMY"
REINFORCED CONCRETE
 "STRENGTH OF CAST IRON AT ONE-THIRD THE COST"
**CONCRETE PRODUCTS COMPANY
OF PITTSBURGH**
 DIAMOND BANK BUILDING
 PITTSBURGH, PA.

CONCRETE

CULVERTS



For twenty-five years Stewart equipment has proved its superiority for Right of Way Fence, Inter-track Fence, Iron and Wire Window Guards, Baggage Room and concourse enclosures on every important railroad.

The oldest installations from the standpoint of strength, service and perfect appearance cannot be distinguished from the new.

The world's largest factory and finest reputation is behind

STEWART'S
IRON FENCE
"The Standard of the World"

A corps of designers who will gladly help you solve your fencing problem are at your immediate service.

To make sure of quality iron, mechanical perfection, modern design and universal approval—investigate, specify and insist on Stewart's.

THE STEWART IRON WORKS CO.
 700 Stewart Block Cincinnati, Ohio

"World's greatest iron fence builders."

**Blast Your Pole Holes
WITH
DU PONT
EXPLOSIVES**

Cuts the labor cost of pole and post erection fifty per cent, and insures you a permanently secure line and continuous service.

Use this modern method in telephone, telegraph and power line construction, signal systems, crossing warnings, tower foundations, etc. Quick, efficient and satisfactory results secured by blasting your excavations with DU PONT EXPLOSIVES.

Test this method. It will save you time and money.
GET OUR FREE BOOKLET:
 "Blasting Pole and Post Holes."

E. I. du Pont de Nemours & Co.
 ESTABLISHED 1802
 Wilmington,
 Delaware



Labor Scarce? Use Mixers!

Lots of small concrete jobs up and down the line that he couldn't get finished. Everybody short of help. He cleaned up his "loose ends" by putting a light, Dandie Mixer on the job. Some he put car wheels under and hauled from section to section behind a motor "hand car." He did his concrete work with a few men—and did it right!

DANDIE MIXER

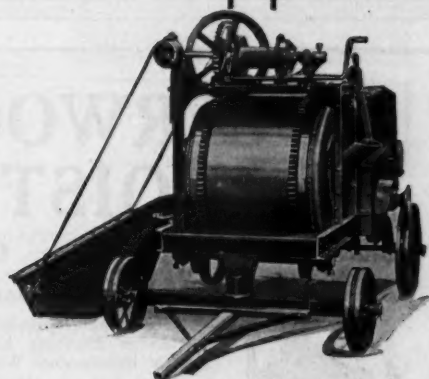
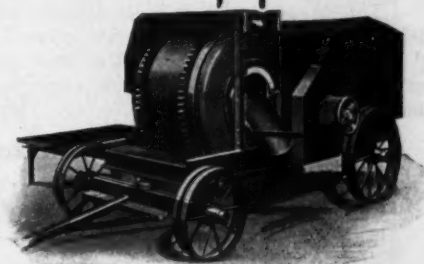
5 and 10 cu. ft., capacities. May be equipped with low charging platform, feed spout, batch hopper or power loader, also automatic water-measuring tank, and light duty hoist.

The Dandie Mixer is a low price, all-steel mixer, with the same mixing action that delivers uniform, thoroughly mixed concrete, which means strong, enduring concrete construction. It is built in big volume by the largest manufacturers of mixers in the world—and built right—with universal bearings, and the railroad truck principle of drum roller construction—simple to operate. Write for Catalog.

KOEHRING MACHINE COMPANY

MILWAUKEE, WIS.

Well
mixed
concrete
for
permanence



Massey Concrete Cattle Pass

Here's a point of superiority you engineers will recognize—only in the Massey cattle pass is the reinforcing placed in the region of tension throughout. The cross-section illustrates this big advantage. The strength it adds should be considered when you are contemplating the installation of cattle passes.

The Massey cattle pass is made up at our factories in units 6' long, 84" wide by 72" high inside. Two head of cattle pass through side by side. A flat bottom gives them broader footing.

The Massey pass is built to carry the dead load in deep fills, and live loads when placed within about 3' of the base of the rail. It is more economical than any other type of structure, and requires absolutely no maintenance.



Massey factories make concrete culvert pipe, 12" to 84" in diameter, concrete bridge slabs, piles, and portable concrete houses. Our plant locations and large stock of standard products enable us to make prompt deliveries at low freight rates.

Get Massey Service with Your Cattle Pass

C. F. MASSEY COMPANY

NEW YORK
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Newark, N. J.
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Factories Located at
Kansas City, Mo.
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LIDGERWOOD HOISTS

Steam Electric Gasoline

A Complete Line of Contractors' Standard Hoists.

Illustration represents improved
Bridge Erecting Engine with
Six Independent Winch Heads.

Derricks Cableways
Rapid Unloaders
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Write for Catalogues.

Lidgerwood Mfg. Co.,

96 Liberty St., New York

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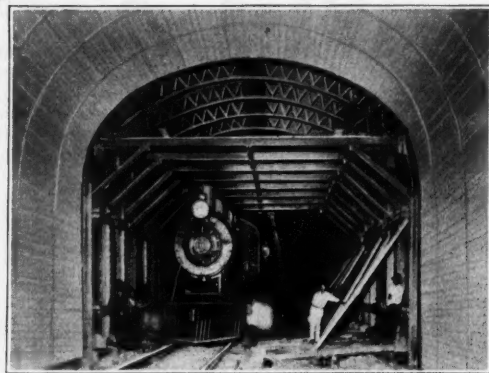
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Speed W
Strength
Capacity



RAPID WORK—LOWER COST BETTER RESULTS AND NO DELAY IN TRAFFIC

These are some of the advantages secured by railroads that line tunnels by the

**Pneumatic Method of
Mixing and Conveying Concrete**
(Patented)

Labor cost and time are reduced to one-third. Less equipment is required—No other mixer, no cars, no tracks, no elevated platforms, no locomotives.

Tests of small blocks taken at random from the Wilson Avenue Tunnel, Chicago, for testing, proved not alone their exceeding density, but in many cases proved so hard that the equipment of the Underwriters' Laboratory could not crush them.

Used by C. B. & Q. and other leading roads. They secure better work at half the cost of other methods.

We lease equipment, or do work on contract.
Send for descriptive literature.

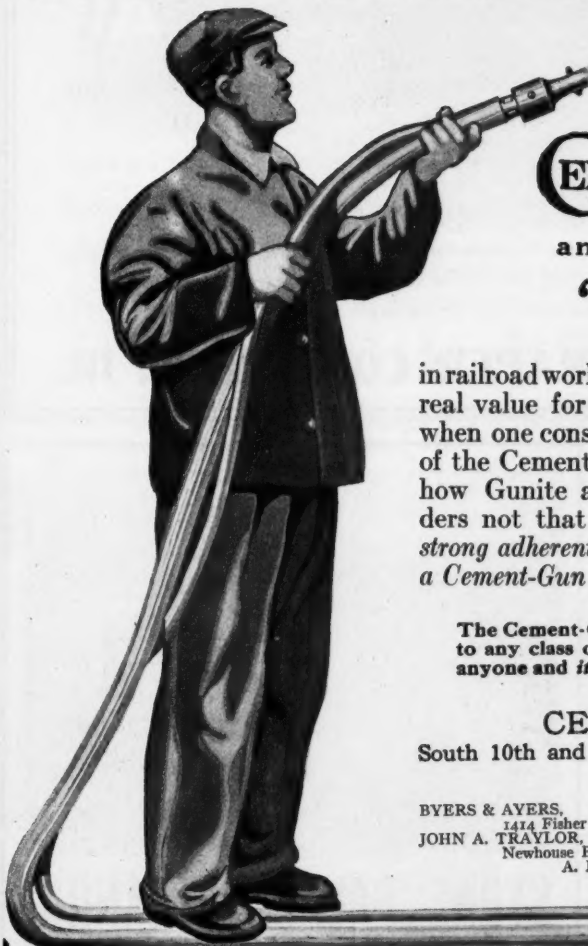
CONCRETE MIXING & PLACING CO.
123 W. Madison St. - - CHICAGO

"Try The Cement-Gun"

"Try the Cement-Gun." So spoke Mr. Cass Gilbert, the architect of the Woolworth Building, New York, after its free columns had been concreted up to the fifth floor. They did, and the result—55 stories shot with GUNITE, and more, that GUNITE applied to a thickness of $1\frac{1}{2}$ to 2 inches took the place of four to six inches of concrete. That suggestion was made by Mr. Cass Gilbert a few years ago; today in concrete work of all kinds, the suggestion has become an order to

Use the Cement-Gun and Secure Saving and Safety

In all kinds of construction work, in all parts of the country, engineers have heeded that advice of Mr. Gilbert's, and by so doing have secured efficiency and economy in accomplishing work, as well as strength and service. The record of the



CEMENT-GUN
and its product
"Gunitite"

in railroad work have proved their real value for such service, and when one considers the economy of the Cement-Gun method and how Gunitite adheres, one wonders not that the Railroads are strong adherents of the practice of a Cement-Gun for every division.

The Cement-Gun is not a restricted article, nor are its services restricted to any class of work. It can be purchased outright from us and used by anyone and it should be used by everyone who has concrete work to do.

CEMENT-GUN COMPANY, Inc.

South 10th and Mill Streets,

Allentown, Pa.

NEW YORK OFFICE, 30 Church Street

BYERS & AYERS,
1414 Fisher Building, Chicago, Ill.

JOHN A. TRAYLOR,
Newhouse Building, Salt Lake City, Utah

A. R. ROBERTS, 727 Traders Bank Building, Toronto, Ont., Can.

TAYLOR ENGINEERING CO.,
538 Central Building, Seattle, Wash.

TAYLOR ENGINEERING CO.,
Vancouver, B. C.

ROUNDHOUSE OF WESTERN MARYLAND RAILWAY, MARYLAND JUNCTION, W. VA., coated with Gunitite, applied by the Cement-Gun.

Use the Coupon

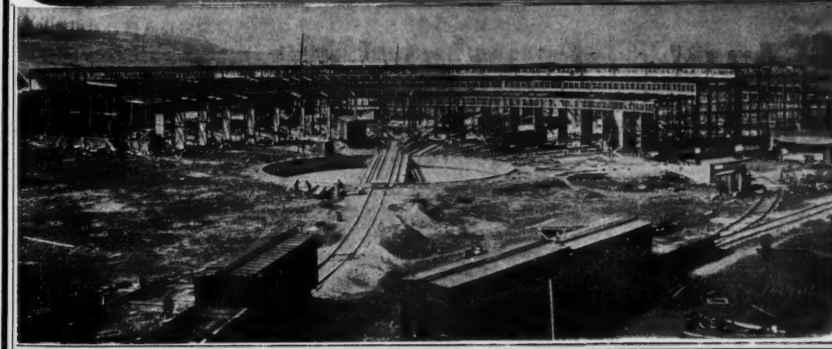
The Big Economies the Cement-Gun accomplishes in Railway Maintenance Work. Interests Me. Please send booklet of data, facts and figures.

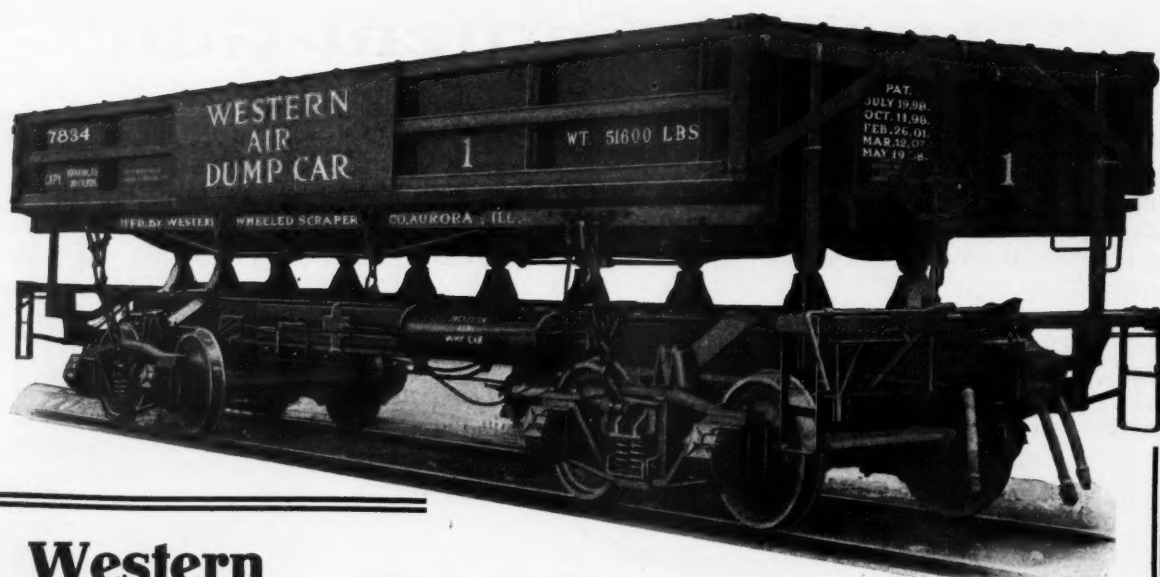
Name.....

Address.....



WOOLWORTH BUILDING, NEW YORK, DURING CONSTRUCTION
Fifty-five stories high
Steel fireproofed with Gunitite





Western 30-Yard Air Dump Car

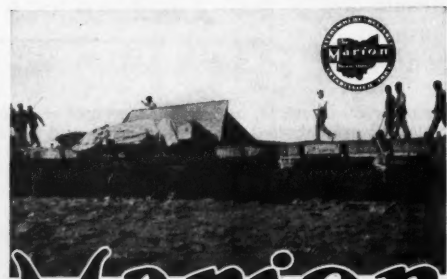
Built either all **steel**, or with the floor, ends and sides of the bed of wood with frame of steel.

The enormous loads carried by this car make it of special value on standard railroad lines where the length of haul is long.

The dead weight of the train is much less per ton of load than in the smaller car, though it can be dumped as cheaply.

Send for illustrated catalogue giving much dumping information.

WESTERN WHEELED SCRAPER CO., Aurora, Ill.



Marion

*Steam Shovels, Dredges, Draglines
and Kindred Machinery*

MARION Ballast Unloaders form an important group in the big family of Marion Products—the nine distinct sizes and types which we make have for thirty years been standard with railway systems, here and abroad. Marion Ballast Unloaders can be used on

Straight Track or Curves With Any Material, Coarse or Fine

On curves a snatch block will hold the cable in line. Marion Unloaders will unload clay, sand, loam, gravel, crushed stone, boulders, blasted rock and similar materials; can be used on common flat cars or ballast cars with hinged side boards. Particulars gladly furnished on request.

The Marion Steam Shovel Company, Marion, Ohio

Branches: Atlanta, Chicago, New York, Philadelphia, San Francisco, Seattle

ESTABLISHED 1884



STONE BALLAST CLEANING

Can be done and is being done on some of the best railroads in the country at a saving of 56% by the use of the

TRENCH-ZEPP STONE BALLAST CLEANER

Such economy well deserves your investigation.

Write for booklet of cuts and a copy of the latest report on Stone Ballast Cleaning by this new method.

LITTLEFORD BROS.

MANUFACTURERS CINCINNATI, OHIO SOLE AGENTS



Insuring Against Culvert Renewal Expense



Twenty-four inch National Lock-Joint Cast-Iron Pipe installed in fill 28 ft. high on the P. R. R. System.

Here are three views taken on the Pennsylvania's new line between Indianapolis and Frankfort, showing some big fills under construction, and more, showing how the Pennsylvania insures against culvert renewal expense by installing

National Lock-Joint Cast-Iron Pipe

Wood will rot, steel or refined iron rust, clay or earthenware disintegrate, but this culvert pipe, made from remelted Alabama Pig Iron, remains as permanent as your road bed. That is why over forty of the large trunk lines of this country *specify and insist on* National Lock-Joint Cast-Iron Pipe.

The Pipe of Short Units, Long Service and Low Costs



Forty-two inch National Lock-Joint Cast-Iron Culvert Pipe under a fill 45 feet high and 42 feet wide at the top, on the P. R. R. System.

The pipe which, due to its short units, permits easy handling, that can be installed by the ordinary section gang without accessory of any kind. The pipe with the joint that locks effectively, *prevents* separation, and *assures* alignment. The pipe that is sold by the foot, of low first cost, and which assures economy from the start and insures economy thru the years. Is it any wonder National Lock-Joint Cast-Iron Pipe is the standard of so many railroads, and that they look to it for



Installation of National Lock-Joint Cast-Iron Culvert Pipe under a fill 40 feet high and 38 feet wide at top, on the P. R. R. System.

Insuring Against Culvert Renewal Expense

CATALOGUE AND PRICES ON REQUEST



AMERICAN CASTING CO.
Birmingham, Ala.
Chicago Office: - Peoples Gas Building
New England Representative
Fred A. Haudette & Son - Boston, Mass.
St. Louis Representative
H. P. Webb - Wainwright Building
St. Paul Office
Contractor's Supply and Equipment Co.



Reducing the Cost of Printed Matter

"The National Cash Register Co., of Dayton, recently threw its list of 1,000,000 names into the discard. * * * The company had been spending in the neighborhood of \$30,000 a year in its efforts to keep the list of more than a million names up to date, and *it was realized that even with such supervision as this* there were a great many dead men and bankrupt firms to whom matter was being sent from time to time."—From an article "*National Cash Register Co., Junks Big Mailing List*" in the February issue of ASSOCIATED ADVERTISING.

THE high cost of printed matter is causing a lot of people to give serious thought to the direct literature method of reaching possible buyers. Already the much overworked "house organ" has been abandoned by many who have been consistent advocates of their use; and now the office mailing list is being weighed in the balance.

There can be no doubt about the advisability of maintaining an office mailing list of regular customers who should receive catalogues and special announcements; but **any attempt to keep a list for general circularizing purposes is an extravagant mistake.**

To begin with, not even in this field, with the names and addresses of many officers of the railways of North America easily available, is it possible to build an initial list that would be as much as 50 per cent complete. Keeping this fractional list up to date means constant reports from a large number of salesmen and some clerical help. A glance at any one issue of the RAILWAY AGE GAZETTE, which records the appointments, transfers, resignations and deaths of *certain classes of officials only* will give one an idea of the large number of changes that occur among general officers alone in the course of a year.

With the greatest care there will always be a lot of inaccuracies. And when the literature is finally mailed, what percentage, actually falls into the hands of the persons to whom it is addressed, especially if any considerable number happen to be railway officers who employ chief clerks who open and sort their mail?

And of what use is a *partial* list anyway? What about the other 50 per cent. or more?

On the other hand, the mailing lists of responsible business papers are very nearly complete and are kept up to date automatically. The subscribers are carefully selected with respect to their buying power. The subscription lists of the five Simmons-Boardman publications contain the names of several thousands of railway officers who do not appear in any printed list; and many of them are unknown to manufacturers of railway materials and supplies, although they have much to do with specifying and buying.

So why not reduce YOUR printed matter costs by following the example of the National Cash Register Company, which has decided to abandon its office mailing list for business getting purposes and instead advertise more liberally?

Our Service Department is equipped to give full information about the sale possibilities in the railway field and to outline a campaign that will produce results. Address our nearest office.

SIMMONS-BOARDMAN PUBLISHING COMPANY

New York	Chicago	Cleveland	Washington
Woolworth Bldg.	Transportation Bldg.	Citizens' Bldg.	Home Life Bldg.

THE RAILWAY AGE GAZETTE is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

